5.3 Exercises

[11-09-06-L11]

Simplify each of the following. Assume that all variables represent positive real numbers. See Examples 3–5.

1. $\sqrt{18}$
2. $-\sqrt{48}$
3. $\sqrt{150}$
4. $\sqrt{300}$
5. $\sqrt{76}$
6. $\sqrt{52}$
7. $\sqrt[3]{16}$
8. $\sqrt[3]{250}$
9. $\sqrt[3]{128}$
10. $\sqrt[3]{375}$
11. $\sqrt[4]{32}$
12. $\sqrt[4]{243}$
13. $-\sqrt[4]{1250}$
14. $-\sqrt[4]{512}$
15. $\sqrt[5]{128}$
16. $\sqrt[5]{486}$
17. $\sqrt{\frac{72}{25}}$
18. $\sqrt{\frac{80}{9}}$
19. $\sqrt[3]{\frac{32}{125}}$
20. $\sqrt[3]{\frac{81}{1000}}$
21. $\sqrt{100y^{10}}$
22. $\sqrt{256z^6}$
23. $-\sqrt[3]{8k^9}$
24. $-\sqrt[3]{27y^{15}}$
25. $-\sqrt{144m^{10}z^2}$
26. $-\sqrt{4k^2z^{18}}$
27. $-\sqrt[3]{-125m^9b^{18}c^{24}}$
28. $\sqrt[3]{-216y^{12}x^3z^{18}}$
29. $\sqrt[4]{\frac{1}{16}m^{12}x^{16}}$
30. $\sqrt[4]{\frac{81}{256}k^4m^8}$
31. $\sqrt{75y^3}$
32. $\sqrt{200z^3}$
33. $\sqrt{7x^5y^6}$
34. $\sqrt{12k^9p^{12}}$
35. $\sqrt[3]{8z^9r^{12}}$
36. $\sqrt[3]{125k^{15}n^9}$
37. $\sqrt[3]{24z^5x^9}$
38. $\sqrt[3]{81w^7y^8}$
39. $\sqrt[4]{16a^8b^{12}}$
40. $\sqrt[4]{81z^{16}y^{20}}$
41. $\sqrt[4]{32k^5m^{10}}$
42. $\sqrt[4]{162r^{15}s^{10}}$
43. $\sqrt{\frac{m^9}{16}}$
44. $\sqrt{\frac{y^{15}}{100}}$
45. $\sqrt[3]{\frac{y^{10}}{27}}$
46. $\sqrt[3]{\frac{r^{26}}{125}}$
47. $\sqrt[4]{\frac{t^{23}}{16}}$
48. $-\sqrt[4]{\frac{8a^9}{81}}$

Rationalize the denominators. Assume that all variables represent positive real numbers. See Examples 6 and 7.

49. $\frac{15}{\sqrt{5}}$
50. $\frac{20}{\sqrt{10}}$
51. $\frac{25}{\sqrt{7}}$
52. $\frac{50}{\sqrt{15}}$
53. $\frac{\sqrt{7}}{\sqrt{5}}$
54. $\frac{\sqrt{5}}{\sqrt{11}}$
55. $\frac{20\sqrt{3}}{\sqrt{5}}$
56. $\frac{12\sqrt{7}}{\sqrt{2}}$
57. $\frac{9}{\sqrt{20}}$
58. $\frac{5}{\sqrt{18}}$
59. $\frac{-6\sqrt{5}}{\sqrt{12}}$
60. $\frac{-4\sqrt{3}}{\sqrt{32}}$
61. $\sqrt{\frac{5}{18}}$
62. $\sqrt{\frac{21}{125}}$
63. $\frac{8\sqrt{3}}{\sqrt{k}}$
64. $\frac{6\sqrt{7}}{\sqrt{r}}$
65. $\sqrt{\frac{5m}{k}}$
66. $\sqrt{\frac{3p}{q}}$
67. $\frac{5\sqrt{2m}}{\sqrt{y^3}}$
68. $\frac{2\sqrt{5r}}{\sqrt{m^3}}$
69. $-\sqrt{\frac{48k^2}{z}}$
70. $-\sqrt{\frac{75m^3}{p}}$
71. $\sqrt{\frac{32p^4}{q^3}}$
72. $\sqrt{\frac{72x^8}{y^3}}$
73. $\sqrt[3]{\frac{9}{32}}$
74. $\sqrt[3]{\frac{10}{9}}$
75. $\sqrt[3]{\frac{x^6}{y}}$
76. $\sqrt[3]{\frac{m^9}{q}}$

Simplify each of the following. Assume that all variables represent positive real numbers.

77. $\sqrt[3]{\frac{r^{15}}{s^8}}$
78. $\sqrt[3]{\frac{p^{12}}{q^{11}}}$
79. $\frac{\sqrt[3]{k}\cdot\sqrt[3]{km}}{\sqrt[3]{m^2}}$
80. $\frac{\sqrt[4]{xz}}{\sqrt[4]{xz^2}\cdot\sqrt[4]{x^2z}}$
81. $\frac{\sqrt[5]{a^2b^3}}{\sqrt[5]{a^3}\cdot\sqrt[5]{ab^7}}$
82. $\frac{\sqrt[5]{m^2p^4}\cdot\sqrt[5]{m}}{\sqrt[5]{m^4p}}$

Simplify each of the following. Assume that all variables represent positive real numbers. See Example 8.

83. $\sqrt[4]{12^2}$
84. $\sqrt[6]{21^3}$
85. $\sqrt[10]{m^{15}}$
86. $\sqrt[8]{y^6}$
87. $\sqrt[4]{25}$
88. $\sqrt[6]{8}$
89. $\sqrt[6]{256}$
90. $\sqrt[8]{64}$

Write as radicals with the same index and simplify. Assume all variables represent positive real numbers. See Example 9.

91. $\sqrt[3]{5}\cdot\sqrt{3}$
92. $\sqrt[3]{3}\cdot\sqrt[4]{6}$
93. $\sqrt[3]{2}\cdot\sqrt[5]{3}$
94. $\sqrt[4]{8}\cdot\sqrt[5]{3}$
95. $\sqrt{x}\cdot\sqrt[3]{x}$
96. $\sqrt[3]{y}\cdot\sqrt[4]{y}$

77. $x^{-3/2}$ **79.** $x^{9/4}$ **81.** $(m + r)^{1/2}$ **83.** $(m^3 + r^3)^{1/4}$ **85.** $(m - 5n)^{1/3}$ **87.** $(9m^2p)^{1/3}$
89. $2m^{1/2} - 5m^{2/3}$ **91.** $|m^3|$ or $m^2|m|$ **93.** $4|z|$ **95.** $5r^2|z^5|$ or $5r^2z^4|z|$ **97.** $|r - 2q|$
99. $|m - q|$ **101.** $-5/|p^2 - q^2|$ **103.** $y^{5/6}$ **105.** $m^{1/6}$ **107.** $x^{1/24}$ **111.** p^{11}
113. $1/(24x^8)$ **115.** $s/(16r)$

Section 5.3 (page 222)
1. $3\sqrt{2}$ **3.** $5\sqrt{6}$ **5.** $2\sqrt{19}$ **7.** $2\sqrt[3]{2}$ **9.** $4\sqrt[3]{2}$ **11.** $2\sqrt[4]{2}$ **13.** $-5\sqrt[4]{2}$
15. $2\sqrt[5]{4}$ **17.** $6\sqrt{2}/5$ **19.** $2\sqrt[3]{4}/5$ **21.** $10y^5$ **23.** $-2k^3$ **25.** $-12m^5z$
27. $5m^3b^6c^8$ **29.** $m^3x^4/2$ **31.** $5y\sqrt{3y}$ **33.** $x^2y^3\sqrt{7x}$ **35.** $2z^3r^4$ **37.** $2zx^3\sqrt[3]{3z^2}$
39. $2a^2b^3$ **41.** $2km^2\sqrt[4]{2km^2}$ **43.** $m^4\sqrt{m}/4$ **45.** $y^3\sqrt[3]{y}/3$ **47.** $t^5\sqrt[4]{t^3}/2$
49. $3\sqrt{5}$ **51.** $25\sqrt{7}/7$ **53.** $\sqrt{35}/5$ **55.** $4\sqrt{15}$ **57.** $9\sqrt{5}/10$ **59.** $-\sqrt{15}$
61. $\sqrt{10}/6$ **63.** $8\sqrt{3k}/k$ **65.** $\sqrt{5mk}/k$ **67.** $5\sqrt{2my}/y^2$ **69.** $-4k\sqrt{3z}/z$
71. $4p^2\sqrt{2q}/q^2$ **73.** $\sqrt[3]{18}/4$ **75.** $x^2\sqrt[3]{y^2}/y$ **77.** $r^5\sqrt[3]{s}/s^3$ **79.** $\sqrt[3]{k^2m^2}/m$
81. $\sqrt[5]{a^3b}/ab$ **83.** $2\sqrt{3}$ **85.** $\sqrt{m^3}$ or $m\sqrt{m}$ **87.** $\sqrt{5}$ **89.** $\sqrt[3]{2^4}$ or $\sqrt[3]{16}$ or $2\sqrt[3]{2}$
91. $\sqrt[6]{675}$ **93.** $\sqrt[15]{864}$ **95.** $\sqrt[6]{x^5}$ **97.** $5\sqrt{21}/3$ feet **99.** $6x^2$ **101.** $11q - 6q^2$
103. $16a^5 - 9a^2 + 4a$ (cannot be simplified further)