

Fundamental Math 10033 Chapter 5  
Supplemental Problems

SECTION 5.1  
Perfect nth roots

Find each root if it is a real number.

1.  $\sqrt{81}$
2.  $-\sqrt{121}$
3.  $\sqrt{\frac{9}{16}}$
4.  $-\sqrt{400}$
5.  $-\sqrt{\frac{100}{49}}$
6.  $\sqrt{-4}$
7.  $\sqrt[3]{-8}$
8.  $-\sqrt[4]{16}$
9.  $\sqrt[3]{1000}$
10.  $\sqrt[3]{-\frac{125}{27}}$
11.  $-\sqrt[3]{64}$
12.  $\sqrt[4]{-256}$
13.  $\sqrt[5]{-32}$
14.  $\sqrt[3]{\frac{-1}{8}}$
15.  $-\sqrt{\frac{1}{4}}$

SECTION 5.2  
Simplifying Radicals and Operations with Radicals

Simplify.

1.  $\sqrt{40}$
2.  $\sqrt{81 + 25}$
3.  $\sqrt[3]{250}$
4.  $\sqrt{96}$
5.  $\sqrt[3]{-135}$
6.  $\sqrt[4]{\frac{32}{81}}$
7.  $\sqrt[3]{-\frac{54}{8}}$

Combine and simplify.

8.  $\sqrt{27} - \sqrt{192}$
9.  $3\sqrt{20} + 5\sqrt{45}$
10.  $4\sqrt[3]{16} - 2\sqrt[3]{2} + 2\sqrt{2} - 2\sqrt{16}$
11.  $\sqrt{\frac{8}{49}} - \sqrt{\frac{50}{9}}$
12.  $5\sqrt{27x} - \sqrt{75x}$

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13.  $\sqrt{\frac{3}{25}} + 4\sqrt{\frac{3}{100}}$

Multiply and simplify.

14.  $\sqrt{15} \cdot \sqrt{6}$

15.  $3\sqrt{2} \cdot 5\sqrt{32}$

16.  $\sqrt[3]{9} \cdot \sqrt[3]{-9}$

17.  $\sqrt{3}(\sqrt{8} - \sqrt{3})$

18.  $(\sqrt{5} + 2)^2$

19.  $(\sqrt{7} + 1)(\sqrt{14} - 2\sqrt{7})$

Divide and simplify.

20.  $\frac{\sqrt{150}}{\sqrt{2}}$

21.  $\frac{\sqrt{96x^3}}{\sqrt{8x^2}}$

22.  $\frac{\sqrt[3]{540}}{\sqrt[3]{10}}$

23.  $\frac{\sqrt[3]{-81}}{\sqrt[3]{24}}$

24.  $\frac{\sqrt{30x} \sqrt{12x^2}}{\sqrt{20x^3}}$

25.  $\frac{\sqrt[4]{567x^3}}{\sqrt[4]{112x^3}}$

Rationalize the denominator and simplify.

26.  $\frac{4}{\sqrt{2}}$

27.  $\frac{6}{\sqrt{8}}$

28.  $\frac{5}{\sqrt[3]{2}}$

29.  $\frac{3}{\sqrt{18}}$

30.  $\frac{12}{\sqrt[3]{-3}}$

31.  $\frac{9x}{\sqrt{3}}$

Rationalize the denominator and simplify.

32.  $\frac{4}{2+\sqrt{5}}$

33.  $\frac{2}{3-\sqrt{2}}$

34.  $\frac{\sqrt{3}}{\sqrt{15}-2}$

35.  $\frac{5}{\sqrt{2}-\sqrt{6}}$

36.  $\frac{\sqrt{3}+1}{3-\sqrt{3}}$

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37.  $\frac{\sqrt{5}-1}{\sqrt{5}+1}$

SECTION 5.3

Simplifying  $\sqrt[m]{x^m}$

Simplify.

1.  $\sqrt{8x^3}$

2.  $\sqrt{162x^2}$

3.  $\sqrt[3]{-24x^6}$

4.  $\sqrt{72x^3}$

5.  $\sqrt[4]{x^9}$

6.  $\sqrt{\frac{12}{x^3}}$

7.  $\sqrt[3]{\frac{27x^5}{16}}$

Perform the operations and simplify.

8.  $3\sqrt{8x^2} - \sqrt{50x^2}$

9.  $\sqrt{16x^4} + \sqrt{x^2}$

10.  $\sqrt[3]{x^6} - 2\sqrt{x^2}$

11.  $\sqrt{2x^2} + 6\sqrt{32x^2} - 2\sqrt{x^2}$

12.  $\sqrt{12y^3} + \sqrt{27y^3} + 3y\sqrt{3y}$

13.  $\sqrt{28x^2} - \sqrt{63x^2} + \sqrt[3]{56x^3}$

14.  $\sqrt{8x} \sqrt{2x}$

15.  $(\sqrt{2x} - 1)(3\sqrt{2x} + 2)$

16.  $\sqrt{5x^3} \cdot \sqrt{10x^4}$

17.  $\sqrt[3]{30x^2} \cdot \sqrt[3]{25x^8}$

18.  $\frac{\sqrt[3]{8x^5}}{\sqrt[3]{2x}}$

19.  $\frac{\sqrt{48x^7}}{\sqrt{12x^4}}$

20.  $\frac{\sqrt[3]{80x^7}}{\sqrt[3]{10x}}$

21.  $\frac{\sqrt{75x^4y^5}}{\sqrt{5xy}}$

Solve the equation.

22.  $2x^2 - 98 = 0$

23.  $121 - x^2 = 0$

24.  $16 - 81x^2 = 0$

25.  $5x^2 - \frac{36}{5} = 0$

26.  $400 - 0.01x^2 = 0$

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27.  $200x^2 - 512 = 0$

SECTION 5.4  
Rational Exponents

Evaluate.

1.  $125^{\frac{1}{3}}$
2.  $-9^{\frac{1}{2}}$
3.  $(-64)^{\frac{2}{3}}$
4.  $27^{-\frac{1}{3}}$
5.  $(\frac{25}{4})^{\frac{3}{2}}$
6.  $-(\frac{49}{9})^{-\frac{1}{2}}$
7.  $625^{-\frac{3}{4}}$
8.  $-16^{\frac{3}{4}}$
9.  $32^{-\frac{2}{5}}$
10.  $-64^{\frac{5}{6}}$

Write with a rational exponent.

11.  $\sqrt[3]{6^2}$
12.  $-\frac{1}{\sqrt{5}}$
13.  $\sqrt[4]{9^3}$
14.  $\sqrt[3]{-10}$
15.  $(\sqrt[3]{-7})^3$
16.  $\sqrt{\sqrt{11}}$
17.  $-\sqrt[4]{18}$
18.  $\frac{1}{(\sqrt[3]{9})^2}$
19.  $(\sqrt{13})^4$
20.  $\sqrt{13^4}$

Use rational exponents and the laws of exponents to simplify.

21.  $(8a^3b^{-9})^{\frac{2}{3}}$
22.  $\sqrt{7} \cdot \sqrt[3]{7}$
23.  $\sqrt[3]{\sqrt{8x}}$
24.  $(\frac{64x^6}{y^{-9}})^{\frac{2}{3}}$
25.  $(\frac{a^{\frac{3}{5}}}{ab^3})^2$
26.  $\sqrt{\frac{x^{\frac{1}{3}}}{\sqrt{x}}}$

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27.  $\frac{x^{2y^{-\frac{1}{2}}z^{\frac{1}{3}}}}{x^{-3}y^0z^{-\frac{1}{3}}}$

28.  $(16a^{-4}b^8)^{\frac{3}{4}}$

29.  $(-27x^{-3}y^9)^{-\frac{2}{3}}$

30.  $\frac{\sqrt{36a^2b^{\frac{1}{3}}}}{\sqrt[3]{27a^{\frac{1}{4}}b^2}}$

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SECTION 5.1

ANSWERS — Perfect nth roots

1. 9
2. -11
3.  $\frac{3}{4}$
4. -20
5.  $-\frac{10}{7}$
6. not a real number
7. -2
8. -2
9. 10
10.  $-\frac{5}{3}$
11. -4
12. not a real number
13. -2
14.  $-\frac{1}{2}$
15.  $-\frac{1}{2}$

SECTION 5.2

ANSWERS — Simplifying Radicals and Operations with Radicals

1.  $2\sqrt{10}$
2.  $\sqrt{106}$
3.  $5\sqrt[3]{2}$
4.  $4\sqrt{6}$
5.  $-3\sqrt[3]{5}$
6.  $\frac{2\sqrt[4]{2}}{3}$
7.  $-\frac{3}{2}\sqrt[3]{2}$
  
8.  $-5\sqrt{3}$
9.  $21\sqrt{5}$
10.  $6\sqrt[3]{2} + 2\sqrt{2} - 8$
11.  $-\frac{29\sqrt{2}}{21}$
12.  $10\sqrt{3x}$
13.  $\frac{3\sqrt{3}}{5}$
  
14.  $3\sqrt{10}$

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15. 120
16.  $-3\sqrt[3]{3}$
17.  $2\sqrt{6} - 3$
18.  $9 + 4\sqrt{5}$
19.  $7\sqrt{2} + \sqrt{14} - 2\sqrt{7} - 14$

20.  $5\sqrt{3}$
21.  $2\sqrt{3x}$
22.  $3\sqrt[3]{2}$
23.  $-\frac{3}{2}$
24.  $3\sqrt{2}$
25.  $\frac{3}{2}$

26.  $2\sqrt{2}$
27.  $\frac{3\sqrt{2}}{2}$
28.  $\frac{5\sqrt[3]{4}}{2}$
29.  $\frac{\sqrt{2}}{2}$
30.  $-4\sqrt[3]{9}$
31.  $3x\sqrt{3}$

32.  $4\sqrt{5} - 8$
33.  $\frac{2(3+\sqrt{2})}{7}$
34.  $\frac{3\sqrt{5}+2\sqrt{3}}{11}$
35.  $-\frac{5(\sqrt{2}+\sqrt{6})}{4}$
36.  $\frac{2\sqrt{3}+3}{3}$
37.  $\frac{3-\sqrt{5}}{2}$

SECTION 5.3

ANSWERS — Simplifying  $\sqrt[m]{x^m}$

1.  $2x\sqrt{2x}, x \geq 0$
2.  $9|x|\sqrt{2}$
3.  $-2x^2\sqrt[3]{3}$
4.  $6x\sqrt{2x}, x \geq 0$
5.  $x^2\sqrt[4]{x}, x \geq 0$
6.  $\frac{2}{x}\sqrt{\frac{3}{x}}, x > 0$

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7.  $\frac{3x}{2} \sqrt[3]{\frac{x^2}{2}}$

8.  $|x| \sqrt{2}$

9.  $4x^2 + |x|$

10.  $x^2 - 2|x|$

11.  $25|x| \sqrt{2} - 2|x|$

12.  $8y \sqrt{3y}, y \geq 0$

13.  $2x \sqrt[3]{7} - |x| \sqrt{7}$

14.  $4x, x \geq 0$

15.  $6x - \sqrt{2x} - 2, x \geq 0$

16.  $5x^3 \sqrt{2x}, x \geq 0$

17.  $5x^3 \sqrt[3]{6x}$

18.  $x \sqrt[3]{4x}$

19.  $2x \sqrt{x}, x > 0$

20.  $2x^2, x > 0$

21.  $xy^2 \sqrt{15x}, x, y > 0$

22.  $\pm 7$

23.  $\pm 11$

24.  $\pm \frac{4}{9}$

25.  $\pm \frac{6}{5}$

26.  $\pm 200$

27.  $\pm 1.6$

SECTION 5.4

ANSWERS — Rational Exponents

1. 5

2. -3

3. 16

4.  $\frac{1}{3}$

5.  $\frac{125}{8}$

6.  $-\frac{3}{7}$

7.  $\frac{1}{25}$

8. -8

9.  $\frac{1}{4}$

10. -32



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11.  $6^{\frac{2}{3}}$

12.  $-5^{-\frac{1}{2}}$

13.  $9^{\frac{3}{4}}$

14.  $(-10)^{\frac{1}{3}}$

15.  $(-7)^{\frac{3}{5}}$

16.  $(11^{\frac{1}{2}})^{\frac{1}{2}}$

17.  $-18^{\frac{1}{4}}$

18.  $9^{-\frac{2}{3}}$

19.  $13^2$

20.  $13^2$

21.  $4a^2b^{-6}$

22.  $7^{\frac{5}{6}}$

23.  $(8x)^{\frac{1}{6}}$

24.  $16x^4y^6$

25.  $\frac{1}{a^{\frac{4}{5}}b^6}$

26.  $\frac{1}{x^{12}}$

27.  $\frac{x^{\frac{5}{3}}z^{\frac{2}{3}}}{y^{\frac{1}{2}}}$

28.  $\frac{8b^6}{a^3}$

29.  $\frac{x^2}{9y^6}$

30.  $\frac{2a^{\frac{11}{12}}}{b^{\frac{1}{2}}}$