

Simplifying Radicals

Intermediate Algebra

NAME _____

Problems 1 - 11: Simplify. Do not use a calculator.

1. $\sqrt{81}$

2. $-\sqrt{81}$

3. $\sqrt{-81}$

4. $\sqrt[3]{-27}$

5. $\sqrt[3]{27}$

6. $\sqrt[3]{-27}$

7. $\sqrt[4]{16}$

8. $\sqrt[4]{-16}$

9. $\sqrt[4]{(-2)^4}$

10. $-\sqrt[4]{16}$

11. $\sqrt[4]{2^8}$

Problems 12 - 20: Assume that all variables represent positive real numbers.

12. $\sqrt[4]{(-2)^8}$

13. $\sqrt{4x^2y^3}$

14. $\sqrt[3]{x^5y^9}$

15. $\sqrt{75x^5}$

16. $\sqrt[3]{16x^3y^7}$

17. $\sqrt[3]{\frac{-81}{x^6}}$

18. $\sqrt[4]{\frac{81}{x^8}}$

19. $\sqrt[4]{\frac{y}{16x^4}}$

20. $\sqrt[3]{\frac{64x}{y^6}}$

Problems 21 and 22: Do not assume that variables represent positive real numbers.

21. $\sqrt[3]{x^3}$

22. $\sqrt[4]{(x-3)^4}$

Problems 23 - 28: Simplify and combine terms, if possible. Assume that all variables represent positive real numbers.

23. $\sqrt{18} + \sqrt{98}$

24. $2\sqrt{9x} - 5\sqrt{16x}$

25. $4\sqrt[5]{64} - 3\sqrt[5]{96}$

26. $\sqrt[3]{\frac{8}{27}} - \sqrt[5]{\frac{32}{243}}$

27. $\sqrt{\frac{2x}{9}} - \frac{\sqrt{8x^3}}{9} + \sqrt{8x}$

28. $\frac{\sqrt{45}}{7} + \frac{3\sqrt{5}}{7}$

Evaluation / Rational Exponents

Intermediate Algebra

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Problems 1 - 21: Evaluate exactly. Write UNDEFINED, if appropriate.

1. $32^{\frac{1}{5}}$

2. $-32^{\frac{1}{5}}$

3. $(-32)^{\frac{1}{5}}$

4. $32^{\frac{2}{5}}$

5. $-32^{\frac{2}{5}}$

6. $(-32)^{\frac{2}{5}}$

7. $32^{-\frac{1}{5}}$

8. $(-32)^{-\frac{1}{5}}$

9. $-32^{-\frac{1}{5}}$

10. $81^{\frac{1}{4}}$

11. $-81^{\frac{1}{4}}$

12. $(-81)^{\frac{1}{4}}$

13. $81^{\frac{3}{4}}$

14. $-81^{\frac{3}{4}}$

15. $(-81)^{\frac{3}{4}}$

16. $81^{-\frac{3}{4}}$

17. $(81^{\frac{1}{4}})^4$

18. $(81^4)^{\frac{1}{4}}$

19. $[(-81)^{\frac{1}{4}}]^4$

20. $[(-81)^4]^{\frac{1}{4}}$

21. $81^{\frac{0}{4}}$

**Radicals / Rational
Exponents**

Intermediate Algebra

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Problems 1 - 4: Evaluate exactly.

1. $(-144)^{\frac{3}{2}}$

2. $-\left(\frac{9}{4}\right)^{\frac{3}{2}}$

3. $\left(\frac{27}{1000}\right)^{-\frac{2}{3}}$

4. $5^{\frac{3}{4}} \cdot 5^{\frac{9}{4}}$

Problems 5 - 8: Simplify. Assume all variables represent positive numbers.

5. $\frac{\left(k^{\frac{5}{4}}\right)^2}{\left(k^3\right)^{\frac{4}{3}}}$

6. Write without a denominator: $\frac{x^b x^{\frac{b}{2}}}{x^{2b}}$

7. $4m^{\frac{5}{3}}\left(m^{-\frac{2}{3}} - 4m^{-\frac{5}{3}}\right)$

8. $\left(\frac{m^{-\frac{3}{3}}}{a^{-\frac{3}{4}}}\right)^4 \left(m^{-\frac{3}{8}} a^{\frac{1}{4}}\right)^{-2}$

9. Write with rational exponents: $4\sqrt[3]{p^2} - \sqrt{p}$

10. Rationalize the numerator: $\frac{\sqrt{10} - \sqrt{6}}{4}$

Problems 11 - 20: Simplify. Assume all variables represent positive numbers.

11. $\sqrt{4x^2 - 4x + 1}$

12. $-\sqrt[3]{27y^{15}}$

13. $(\sqrt{20} - \sqrt{5})(\sqrt{20} + \sqrt{5})$

14. $(\sqrt{27} - \sqrt{3})^2$

15. $(5\sqrt{x} + 1)^2$

16. $9\sqrt{27p^2} - 4p\sqrt{108} - 2\sqrt{48p^2}$

17. $\frac{12 - 9\sqrt{72}}{18}$

18. $\frac{5}{\sqrt{18}}$

19. $\sqrt[3]{\frac{m^9}{q}}$

20. $\frac{-5}{\sqrt{2} + \sqrt{3}}$

Problems 21 - 23: Solve each equation.

$$21. \quad z = \sqrt{z^2 - 4z - 8}$$

$$22. \quad \sqrt{2x + 3} = 2 + \sqrt{x - 2}$$

$$23. \quad r = \sqrt{\frac{5 - r}{6}}$$

ANSWER KEY: 1. Undefined in the reals. 2. $-\frac{27}{8}$ 3. $\frac{100}{9}$ 4. 125 5. $\frac{1}{k^{\frac{3}{2}}}$

$$6. \quad x^{-\frac{b}{2}} \quad 7. \quad 4m - 16 \quad 8. \quad \frac{a^{\frac{5}{2}}}{m^{\frac{23}{12}}} \quad 9. \quad 4p^{\frac{2}{3}} - p^{\frac{1}{2}} \quad 10. \quad \frac{1}{\sqrt{10} + \sqrt{6}} \quad 11. \quad |2x - 1|$$

$$12. \quad -3y^5 \quad 13. \quad 15 \quad 14. \quad 12 \quad 15. \quad 25x + 10\sqrt{x} + 1 \quad 16. \quad -5p\sqrt{3} \quad 17. \quad \frac{2 - 9\sqrt{2}}{3}$$

$$18. \quad \frac{5\sqrt{2}}{6} \quad 19. \quad \frac{m^3 \sqrt[3]{q^2}}{q} \quad 20. \quad 5\sqrt{2} - 5\sqrt{3} \quad 21. \quad \emptyset \quad 22. \quad \{3, 11\} \quad 23. \quad \left\{\frac{5}{6}\right\}^3$$