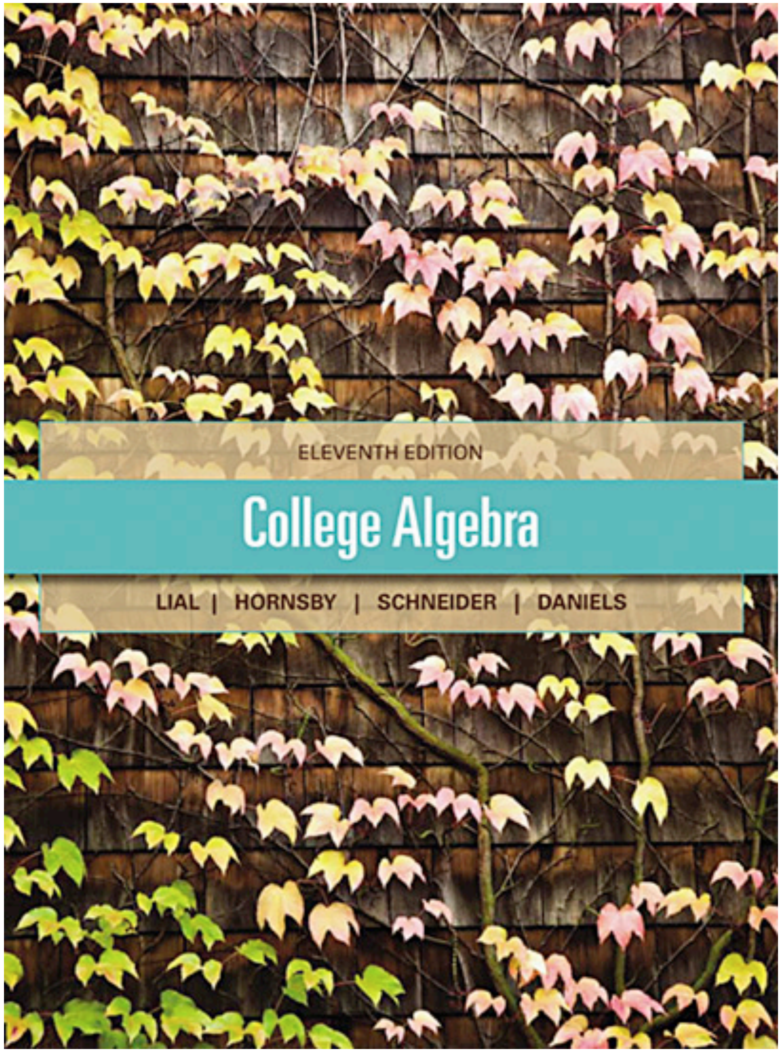
R

Review of Basic Concepts

Sections R.5–R.7



R Review of Basic Concepts

R.5 Rational Expressions

R.6 Rational Exponents

R.7 Radical Expressions

R.5 Rational Expressions

Rational Expressions ▪ Lowest Terms of a Rational Expression ▪ Multiplication and Division ▪ Addition and Subtraction ▪ Complex Fractions

R.5 **Example 1** Finding the Domain (page 41)

Find the domain of the rational expression.

$$\frac{(x-7)(x-1)}{(x+3)(x-1)}$$

Set the denominator equal to zero.

$$x+3=0 \quad \text{or} \quad x-1=0$$

$$x=-3 \quad \text{or} \quad x=1$$

$$\{x \mid x \neq -3, 1\}$$

R.5 Example 2(a) Writing Rational Expressions in Lowest Terms (page 42)

Write the rational expression in lowest terms.

(a) $\dfrac{12x^2 - 30x}{4x^2 - 25} = \dfrac{6x(2x-5)}{(3x+5)(2x-5)}$ Factor.

$= \dfrac{6x}{2x+5}$ Divide out the common factor.

Write the rational expression in lowest terms.

(b) $$\frac{x^2-8x-16}{8x-2x^2} = \frac{(x-4)^2}{2x(4-x)}$$ Factor.

$$= -\frac{(x-4)^2}{2x(x-4)}$$ Multiply numerator and denominator by –1.

$$= -\frac{x-4}{2x}$$ Divide out the common factor.

$$= \frac{-(x-4)}{2x} \text{ or } \frac{4-x}{2x}$$

Example 3(a) Multiplying or Dividing Rational Expressions (page 43)

Multiply.

$$\frac{6z^6}{7}\cdot\frac{28}{9z^2} = \frac{6z^6\cdot 28}{7\cdot 9z^2}$$ Multiply.

$$= \frac{2\cdot 3\cdot 4\cdot 7\cdot z^2\cdot z^4}{7\cdot 3\cdot 3\cdot z^2}$$ Factor.

$$= \frac{8z^4}{3}$$ Divide out common factors, then simplify.

Example 3(b) Multiplying or Dividing Rational Expressions (page 43)

Multiply.

$$\frac{4n^2+3n-10}{2n^2+3n-2}\cdot\frac{2n-1}{n+4}$$

$$=\frac{(n+2)(4n-5)}{(n+2)(2n-1)}\cdot\frac{(2n-1)}{(n+4)}$$ Factor.

$$=\frac{(n+2)(4n-5)(2n-1)}{(n+2)(2n-1)(n+4)}$$ Multiply.

$$=\frac{4n-5}{n+4}$$ Divide out common factors, then simplify.

Example 3(c) Multiplying or Dividing Rational Expressions (page 43)

Divide.

$$\frac{5z^2-16z+3}{z^2+z-12} \div \frac{30z^2-6z}{2z^3+8z^2}$$

$$=\frac{5z^2-16z+3}{z^2+z-12} \cdot \frac{2z^3+8z^2}{30z^2-6z}$$

Multiply by the reciprocal of the divisor.

$$=\frac{(5z-1)(z-3)}{(z+4)(z-3)} \cdot \frac{2z \cdot z(z+4)}{3 \cdot 2z(5z-1)}$$

Factor.

$$=\frac{z}{3}$$

Multiply, then divide out common factors.

Example 3(d) Multiplying or Dividing Rational Expressions (page 43)

Multiply.

$$\frac{x^2-1}{x^3-1}\cdot\frac{xy-2y+3x-6}{xy+3x+y+3}$$

$$=\frac{(x-1)(x+1)}{(x-1)(x^2+x+1)}\cdot\frac{y(x-2)+3(x-2)}{x(y+3)+(y+3)}$$ Factor.

$$=\frac{(x-1)(x+1)}{(x-1)(x^2+x+1)}\cdot\frac{(y+3)(x-2)}{(x+1)(y+3)}$$

$$=\frac{x-2}{x^2+x+1}$$ Multiply, then divide out common factors.

Example 4(a) Adding or Subtracting Rational Expressions (page 44)

Add $\dfrac{3}{10z^4} + \dfrac{2}{15z^2}$

Find the LCD:

$$\left.\begin{array}{l} 10z^4 = 2 \cdot 5 \cdot z^4 \\ 15z^2 = 3 \cdot 5 \cdot z^2 \end{array}\right\} \text{LCD} = 2 \cdot 3 \cdot 5 \cdot z^4 = 30z^4$$

$$\frac{3}{10z^4} + \frac{2}{15z^2} = \frac{3 \cdot 3}{10z^4 \cdot 3} + \frac{2 \cdot 2z^2}{15z^2 \cdot 2z^2}$$

$$= \frac{9}{30z^4} + \frac{4z^2}{30z^4} = \frac{9 + 4z^2}{30z^4}$$

Example 4(b) Adding or Subtracting Rational Expressions (page 44)

Add $\dfrac{7}{m-5}+\dfrac{2m}{5-m}$

Find the LCD: $\left.\begin{array}{l} m-5=m-5 \\ 5-m=(-1)(m-5) \end{array}\right\}$ LCD $= m-5$

$$\frac{7}{m-5}+\frac{2m}{5-m}=\frac{7}{m-5}+\frac{2m(-1)}{(5-m)(-1)}$$

$$=\frac{7}{m-5}+\frac{-2m}{m-5}$$

$$=\frac{7-2m}{m-5}\text{ or }\frac{2m-7}{5-m}$$

Example 4(c) Adding or Subtracting Rational Expressions (page 44)

Subtract $\dfrac{4}{(x-3)(x+5)}-\dfrac{6}{(x+5)(x-5)}$

Find the LCD: $(x-3)(x+5)(x-5)$

$$\frac{4}{(x-3)(x+5)}-\frac{6}{(x+5)(x-5)}$$

$$=\frac{4(x-5)}{(x-3)(x+5)(x-5)}-\frac{6(x-3)}{(x-3)(x+5)(x-5)}$$

$$=\frac{4x-20-(6x-18)}{(x-3)(x+5)(x-5)}=\frac{-2x-2}{(x-3)(x+5)(x-5)}$$

Example 5(a) Simplifying Complex Fractions (page 46)

Simplify $$\frac{3+\frac{4}{x^2}}{6-\frac{1}{x^2}}$$

Multiply the numerator and denominator by the LCD of all the fractions, x^2.

$$\frac{3+\frac{4}{x^2}}{6-\frac{1}{x^2}} = \frac{x^2\left(3+\frac{4}{x^2}\right)}{x^2\left(6-\frac{1}{x^2}\right)} = \frac{3x^2+4}{6x^2-1}$$

Example 5(b) Simplifying Complex Fractions (page 46)

Simplify $$\dfrac{\dfrac{1}{z+1}-\dfrac{1}{z-1}}{\dfrac{1}{z}+\dfrac{1}{z+1}}$$

Multiply the numerator and denominator by the LCD of all the fractions, $z(z+1)(z-1)$.

$$\dfrac{\dfrac{1}{z+1}-\dfrac{1}{z-1}}{\dfrac{1}{z}+\dfrac{1}{z+1}}=\dfrac{z(z+1)(z-1)\left(\dfrac{1}{z+1}-\dfrac{1}{z-1}\right)}{z(z+1)(z-1)\left(\dfrac{1}{z}+\dfrac{1}{z+1}\right)}$$

$$=\dfrac{z(z-1)-z(z+1)}{(z+1)(z-1)+z(z-1)}$$

$$=\dfrac{z^2-z-z^2-z}{z^2-1+z^2-z}=\dfrac{-2z}{2z^2-z-1}$$

R.6 Rational Exponents

Negative Exponents and the Quotient Rule ▪
Rational Exponents ▪ Complex Fractions Revisited

Example 1 Using the Definition of a Negative Exponent (page 50)

Evaluate each expression.

(a) 10^{-3} (b) -5^{-1} (c) $\left(\frac{4}{9}\right)^{-2}$

(a) $10^{-3} = \frac{1}{10^3} = \frac{1}{1000}$

(b) $-5^{-1} = -\frac{1}{5}$

(c) $\left(\frac{4}{9}\right)^{-2} = \frac{1}{\left(\frac{4}{9}\right)^2} = \frac{1}{\frac{16}{81}} = \frac{81}{16}$

Example 1 Using the Definition of a Negative Exponent (cont.)

Write the expression without negative exponents.

(d) $mn^{-4} = \dfrac{m}{n^4}$

(e) $(mn)^{-4} = \dfrac{1}{(mn)^4} = \dfrac{1}{m^4n^4}$

Example 2 Using the Quotient Rule (page 51)

Simplify each expression.

(a) $\dfrac{15^8}{15^3} = 15^{8-3} = 15^5$

(b) $\dfrac{y^4}{y^{-9}} = y^{4-(-9)} = y^{13}$

(c) $\dfrac{35r^6}{25r^{-4}} = \dfrac{7r^{6-(-4)}}{5} = \dfrac{7r^{10}}{5}$

(d) $\dfrac{34a^8b^{11}}{51a^{12}b^5} = \dfrac{34}{51} \cdot \dfrac{a^8}{a^{12}} \cdot \dfrac{b^{11}}{b^5} = \dfrac{2}{3}a^{8-12}b^{11-5}$

$= \dfrac{2}{3}a^{-4}b^6 = \dfrac{2b^6}{3a^4}$

Example 3(a) Using Rules for Exponents (page 51)

Simplify.

$$5x^3\left(2^{-1}x^4\right)^{-3} = 5x^3\left(2^{-1(-3)}x^{4(-3)}\right)$$

$$= 5x^3\left(2^3x^{-12}\right)$$

$$= 5x^{3-12}(8)$$

$$= 5x^{-9}(8)$$

$$= \frac{40}{x^9}$$

R.6 Example 3(b) Using Rules for Exponents (page 51)

Simplify.

$$\frac{30r^{4}s^{-9}}{45r^{-6}s^{3}} = \frac{30}{45}\cdot\frac{r^{4}}{r^{-6}}\cdot\frac{s^{-9}}{s^{3}}$$

$$= \frac{2}{3}\cdot r^{4-(-6)}\cdot s^{-9-3}$$

$$= \frac{2}{3}\cdot r^{10}\cdot s^{-12}$$

$$= \frac{2r^{10}}{3s^{12}}$$

Simplify.

$$\frac{(4b^3)^{-2}(4b^{-1})^{-3}}{(4^{-1}b^3)^{-4}} = \frac{4^{-2}b^{3(-2)}(4^{-3})b^{-1(-3)}}{4^{-1(-4)}b^{3(-4)}}$$

$$= \frac{4^{-2}\cdot 4^{-3}b^{-6}b^{3}}{4^{4}b^{-12}}$$

$$= \frac{4^{-2-3}b^{-6+3}}{4^{4}b^{-12}} = \frac{4^{-5}b^{-3}}{4^{4}b^{-12}}$$

$$= 4^{-5-4}b^{-3-(-12)} = 4^{-9}b^{9} = \frac{b^9}{4^9}$$

R.6 Example 4 Using the Definition of $a^{1/n}$ (page 52)

Evaluate each expression.

(a) $49^{1/2} = 7$

(b) $-144^{1/2} = -12$

(c) $-(144)^{1/2} = -12$

(d) $64^{1/6} = 2$

(e) $(-64)^{1/6}$

not a real number

(f) $-64^{1/6} = -2$

(g) $(-125)^{1/3} = -5$

(h) $-64^{1/3} = -4$

Example 5 Using the Definition of $a^{m/n}$ (page 53)

Evaluate each expression.

(a) $81^{3/4} = \left(81^{1/4}\right)^3 = 3^3 = 27$

(b) $25^{3/2} = \left(25^{1/2}\right)^3 = 5^3 = 125$

(c) $-4^{5/2} = -\left(4^{1/2}\right)^5 = -2^5 = -32$

R.6 Example 5 Using the Definition of $a^{m/n}$ (cont.)

Evaluate each expression.

(d) $(-64)^{2/3} = \left[(-64)^{1/3}\right]^2 = (-4)^2 = 16$

(e) $216^{-2/3} = \left(216^{1/3}\right)^{-2} = 6^{-2} = \frac{1}{6^2} = \frac{1}{36}$

(f) $(-100)^{3/2}$ is not a real number because $(-100)^{1/2}$ is not a real number.

Simplify each expression.

(a) $$\frac{18^{1/2}\cdot 18^{7/2}}{18^3} = \frac{18^{1/2+7/2}}{18^3} = 18^{4-3} = 18^1 = 18$$

(b) $$100^{3/2}\cdot 16^{-3/4} = \left(100^{1/2}\right)^3\left(16^{1/4}\right)^{-3} = 10^3\cdot 2^{-3}$$

$$= 10^3\cdot\frac{1}{2^3} = \frac{10^3}{2^3} = \frac{1000}{8} = 125$$

(c) $$4z^{3/4}\cdot 5z^{2/5} = 20z^{3/4+2/5} = 20z^{23/20}$$

Example 6 Using the Rules for Exponents (cont.)

Simplify each expression.

(d) $\left(\dfrac{5m^{4/3}}{n^{2/3}}\right)^2\left(\dfrac{m^4}{8n^5}\right)^{1/3} = \dfrac{5^2m^{8/3}}{n^{4/3}}\cdot\dfrac{m^{4/3}}{8^{1/3}n^{5/3}}$

$= \dfrac{25m^{8/3+4/3}}{2n^{4/3+5/3}} = \dfrac{25m^4}{2n^3}$

(e) $y^{3/7}\left(y^{4/7}-5y^{11/7}\right) = y^{3/7+4/7}-5y^{3/7+11/7}$

$= y-5y^2$

Example 7 Factoring Expressions with Negative or Rational Exponents (page 54)

Factor out the least power of the variable or variable expression.

(a) $28y^{-5} + 21y^{-2} = 7y^{-5}(4 + 3y^{3})$

(b) $18n^{4/3} - 12n^{1/3} = 6n^{1/3}(3n - 2)$

(c) $(x+3)^{-2/5} - (x+3)^{3/5} = (x+3)^{-2/5}[1 - (x+3)]$

$= (x+3)^{-2/5}(-2 - x)$

Example 8 Simplifying a Fraction with Negative Exponents (page 55)

Simplify. Write the result with only positive exponents.

$$\frac{x^{-1}+y^{-1}}{x^{-2}-y^{-2}} = \frac{\frac{1}{x}+\frac{1}{y}}{\frac{1}{x^2}-\frac{1}{y^2}} = \frac{\frac{x+y}{xy}}{\frac{y^2-x^2}{x^2y^2}}$$

$$= \frac{x^2y^2 \cdot \frac{x+y}{xy}}{x^2y^2 \cdot \frac{y^2-x^2}{x^2y^2}} = \frac{xy(x+y)}{y^2-x^2}$$

$$= \frac{xy(x+y)}{(y-x)(y+x)} = \frac{xy}{y-x}$$

Divide out the common factor

R.7 Radical Expressions

Radical Notations ▪ Simplified Radicals ▪ Operations with Radicals ▪ Rationalizing Denominators

Example 1 Evaluating Roots (page 59)

Write each root using exponents and evaluate.

(a) $\sqrt[3]{27} = 27^{1/3} = 3$

(b) $-\sqrt[4]{10{,}000} = -10{,}000^{1/4} = -10$

(c) $\sqrt[3]{-216} = (-216)^{1/3} = -6$

(d) $\sqrt[4]{-81}$ is not a real number.

Example 1 Evaluating Roots (cont.)

Write each root using exponents and evaluate.

(e) $\sqrt[3]{\frac{125}{512}} = \left(\frac{125}{512}\right)^{1/3} = \frac{125^{1/3}}{512^{1/3}} = \frac{5}{8}$

(f) $-\sqrt[5]{-243} = -(-243)^{1/5} = -(-3) = 3$

R.7 Example 2 Converting From Rational Exponents to Radicals (page 60)

Write in radical form and simplify.

(a) $16^{3/4} = \left(\sqrt[4]{16}\right)^3 = 2^3 = 8$

(b) $(-64)^{2/3} = \left(\sqrt[3]{-64}\right)^2 = (-4)^2 = 16$

(c) $-121^{3/2} = -\left(\sqrt{121}\right)^3 = -11^3 = -1331$

(d) $y^{7/8} = \sqrt[8]{y^7}, y \geq 0$

Example 2 Converting From Rational Exponents to Radicals (cont.)

Write in radical form and simplify.

(e) $7z^{4/5} = 7\sqrt[5]{z^4}$

(f) $12q^{-1/4} = \dfrac{12}{\sqrt[4]{q}}, q > 0$

(g) $(5x + 2y)^{1/6} = \sqrt[6]{5x + 2y}$

Example 3 Converting From Radicals to Rational Exponents (page 60)

Write in exponential form.

(a) $\sqrt[7]{n^3} = n^{3/7}$

(b) $\sqrt[4]{10x} = (10x)^{1/4}$

(c) $15\left(\sqrt[3]{r}\right)^4 = 15r^{4/3}$

(d) $-2\sqrt[5]{\left(3x^2\right)^8} = -2\sqrt[5]{3^8x^{16}} = -2\cdot 3^{8/5}x^{16/5}$

(e) $\sqrt[3]{r^2+s^4} = \left(r^2+s^4\right)^{1/3}$

Example 4 Using Absolute Value to Simplify Roots (page 61)

Simplify each expression.

(a) $\sqrt{z^6} = \sqrt{\left(z^3\right)^2} = \left|z^3\right|$

(b) $\sqrt[7]{t^7} = t^{7/7} = t$

(c) $\sqrt{81r^8s^{10}} = \left|9r^4s^5\right| = 9r^4\left|s^5\right|$

(d) $\sqrt[4]{(-3)^4} = \left|-3\right| = 3$

Example 4 Using Absolute Value to Simplify Roots (cont.)

Simplify each expression.

(e) $\sqrt[5]{m^{10}} = m^{10/5} = m^2$

(f) $\sqrt{(3x-4)^2} = |3x-4|$

(g) $\sqrt{x^2 - 10x + 25} = \sqrt{(x-5)^2} = |x-5|$

R.7 Example 5 Simplifying Radical Expressions (page 62)

Simplify each expression.

(a) $\sqrt{5} \cdot \sqrt{45} = \sqrt{5 \cdot 45} = \sqrt{225} = 15$

(b) $\sqrt[5]{n^3} \cdot \sqrt[5]{n^2} = \sqrt[5]{n^3 \cdot n^2} = \sqrt[5]{n^5} = n$

(c) $\sqrt{\dfrac{11}{169}} = \dfrac{\sqrt{11}}{\sqrt{169}} = \dfrac{\sqrt{11}}{13}$

Example 5 Simplifying Radical Expressions (cont.)

Simplify each expression.

(d) $\sqrt[6]{\dfrac{a}{b^{12}}} = \dfrac{\sqrt[6]{a}}{\sqrt[6]{b^{12}}} = \dfrac{\sqrt[6]{a}}{b^2}$

(e) $\sqrt[5]{\sqrt[4]{17}} = \sqrt[20]{17}$

(f) $\sqrt{\sqrt[6]{8}} = \sqrt[12]{8}$

Example 6 Simplifying Radicals (page 62)

Simplify each radical.

(a) $\sqrt{288} = \sqrt{2 \cdot 144} = \sqrt{2} \cdot \sqrt{144} = 12\sqrt{2}$

(b) $-8\sqrt[3]{125} = -8 \cdot 5 = -40$

(c) $\sqrt[3]{128a^6b^8c^{10}} = \sqrt[3]{2 \cdot 64a^6b^6b^2c^9c}$

$= \sqrt[3]{\left(64a^6b^6c^9\right)\left(2b^2c\right)}$

$= 4a^2b^2c^3\sqrt[3]{2b^2c}$

R.7 Example 7 Adding and Subtracting Like Radicals (page 63)

Add or subtract as indicated.

(a) $14\sqrt{5pq} - 11\sqrt{5pq} = (14 - 11)\sqrt{5pq}$

$= 3\sqrt{5pq}$

(b) $\sqrt{75ab^3} - b\sqrt{12ab} = \sqrt{3 \cdot 25ab^2b} - b\sqrt{4 \cdot 3ab}$

$= 5b\sqrt{3ab} - 2b\sqrt{3ab}$

$= \left(5b - 2b\right)\sqrt{3ab}$

$= 3b\sqrt{3ab}$

Example 7 Adding and Subtracting Like Radicals (cont.)

Add or subtract as indicated.

(c) $\sqrt[3]{81x^5y^7}+\sqrt[3]{24x^8y^4}$

$$=\sqrt[3]{27\cdot 3x^3x^2y^6y}+\sqrt[3]{8\cdot 3x^6x^2y^3y}$$

$$=3xy^2\sqrt[3]{3x^2y}+2x^2y\sqrt[3]{3x^2y}$$

$$=\left(3xy^2+2x^2y\right)\sqrt[3]{3x^2y}$$

R.7 Example 8 Simplifying Radicals (page 64)

Simplify each radical.

(a) $\sqrt[10]{2^5} = 2^{5/10} = 2^{1/2} = \sqrt{2}$

(b) $\sqrt[3]{a^9 b^{18}} = a^{9/3} b^{18/3} = a^3 b^6$

(c) $\sqrt[6]{\sqrt[3]{4^2}} = \sqrt[18]{4^2} = 4^{2/18} = 4^{1/9} = \sqrt[9]{4}$

Example 9(a) Multiplying Radical Expressions (page 64)

Find the product.

$$\left(\sqrt{11}+\sqrt{17}\right)\left(\sqrt{11}-\sqrt{17}\right)=\left(\sqrt{11}\right)^2-\left(\sqrt{17}\right)^2$$

Product of the sum and difference of two terms.

$$=11-17=-6$$

Example 9(b) Multiplying Radical Expressions (page 64)

Find the product.

$$\left(5+\sqrt{32}\right)\left(3-\sqrt{2}\right) = \left(5+\sqrt{2\cdot 16}\right)\left(3-\sqrt{2}\right)$$

Simplify $\sqrt{32}$

$$= \left(5+4\sqrt{2}\right)\left(3-\sqrt{2}\right)$$

$$= 15-5\sqrt{2}+12\sqrt{2}-4\sqrt{2}\sqrt{2}$$

FOIL

$$= 15-5\sqrt{2}+12\sqrt{2}-8$$

$$= 7+7\sqrt{2}$$

Example 10 Rationalizing Denominators (page 65)

Rationalize each denominator.

(a) $$\frac{2}{\sqrt{7}} = \frac{2}{\sqrt{7}} \cdot \frac{\sqrt{7}}{\sqrt{7}} = \frac{2\sqrt{7}}{7}$$

(b) $$\sqrt[3]{\frac{4}{9}} = \frac{\sqrt[3]{4}}{\sqrt[3]{9}} = \frac{\sqrt[3]{4} \cdot \sqrt[3]{3}}{\sqrt[3]{3^2} \cdot \sqrt[3]{3}} = \frac{\sqrt[3]{12}}{\sqrt[3]{3^3}} = \frac{\sqrt[3]{12}}{3}$$

Example 11(a) Simplifying Radical Expressions with Fractions (page 65)

Simplify the expression.

$$\frac{\sqrt[3]{a^5 b}}{\sqrt[3]{a^2 b^5}} = \sqrt[3]{\frac{a^5 b}{a^2 b^5}} = \sqrt[3]{\frac{a^3}{b^4}} = \frac{\sqrt[3]{a^3}}{\sqrt[3]{b^4}}$$

Quotient rule

$$= \frac{a}{b\sqrt[3]{b}} = \frac{a\sqrt[3]{b^2}}{b\sqrt[3]{b}\sqrt[3]{b^2}}$$

Rationalize denominator.

$$= \frac{a\sqrt[3]{b^2}}{b\sqrt[3]{b^3}} = \frac{a\sqrt[3]{b^2}}{b \cdot b} = \frac{a\sqrt[3]{b^2}}{b^2}$$

Example 11(b) Simplifying Radical Expressions with Fractions (page 65)

Simplify the expression.

$$\sqrt[4]{\frac{6}{x^8}} - \sqrt[4]{\frac{3}{x^{16}}} = \frac{\sqrt[4]{6}}{\sqrt[4]{x^8}} - \frac{\sqrt[4]{3}}{\sqrt[4]{x^{16}}}$$

Quotient rule

$$= \frac{\sqrt[4]{6}}{x^2} - \frac{\sqrt[4]{3}}{x^4}$$

Simplify the denominators.

$$= \frac{x^2\sqrt[4]{6}}{x^4} - \frac{\sqrt[4]{3}}{x^4}$$

Write with a common denominator.

$$= \frac{x^2\sqrt[4]{6} - \sqrt[4]{3}}{x^4}$$

Subtract the numerators.

R.7 Example 12 Rationalizing a Binomial Denominator (page 66)

Rationalize the denominator.

$$\frac{2}{3+\sqrt{5}} = \frac{2\left(3-\sqrt{5}\right)}{\left(3+\sqrt{5}\right)\left(3-\sqrt{5}\right)}$$

Multiply the numerator and denominator by the conjugate of the denominator.

$$= \frac{2\left(3-\sqrt{5}\right)}{3^2-\left(\sqrt{5}\right)^2} = \frac{2\left(3-\sqrt{5}\right)}{9-5}$$

$$= \frac{2\left(3-\sqrt{5}\right)}{4} = \frac{3-\sqrt{5}}{2}$$