Section 4.4: Simplifying Algebraic Expressions Involving Radicals

Restrictions

$\sqrt{x}$ is defined when $x \geq 0, x \in R$

$\sqrt{x^2}$ is defined when $x \in R$ $\sqrt{x^2} = x$

$\sqrt{x^3}$ is defined when $x \geq 0, x \in R$ $x\sqrt{x}$

$\sqrt{x^4}$ is defined when $x \in R$ x^2

IMPORTANT

odd exponent: defined when $x \geq 0, x \in R$

even exponent: defined when $x \in R$

Example 1: State any restrictions on the variable and simplify.

a) $\sqrt{8x^4}$

is defined when $x \in R$

$= \sqrt{8}\sqrt{x^4}$

$= \sqrt{4 \cdot 2}\ x^2$

$= 2\sqrt{2}\ x^2$

$= 2x^2\sqrt{2}$

b) $4\sqrt{18x^3}$

is defined when $x \geq 0, x \in R$

$= 4\sqrt{18}\sqrt{x^3}$

$= 4\sqrt{9 \cdot 2}\ x\sqrt{x}$

$= 4 \cdot 3\sqrt{2}\ x\sqrt{x}$

$= 12\sqrt{2}\ x\sqrt{x}$

$= 12x\sqrt{2x}$

Example 2: Perform the indicated operation

a) $2\sqrt{4x^4} - \sqrt{8x^4}$

is defined when $x \in R$

$= 2\sqrt{4}\sqrt{x^4} - \sqrt{8}\sqrt{x^4}$

$= 2 \cdot 2 \cdot x^2 - \sqrt{4 \cdot 2}\, x^2$

$= 4x^2 - 2\sqrt{2}\, x^2$

b) $\sqrt{x} + 5\sqrt{x}$

$= 6\sqrt{x}$

c) $(5\sqrt{6x^2})(-2x\sqrt{2x})$

$= -10x\sqrt{12x^3}$

$= -10x\sqrt{12}\sqrt{x^3}$

$= -10x\sqrt{4\cdot 3}\,x\sqrt{x}$

$= -10x\cdot 2\sqrt{3}\,x\sqrt{x}$

$= -20x^2\sqrt{3x}$

d) $-3\sqrt{x}(2\sqrt{2} - 3x)$

$-6\sqrt{2x} + 9x\sqrt{x}$

e) $(2\sqrt{x} + 3)(5 - 3\sqrt{x})$

$= 10\sqrt{x} - 6\sqrt{x^2} + 15 - 9\sqrt{x}$

$= 1\sqrt{x} - 6x + 15$

#1(omit c), #2, #3a,b,c #4a,b #6a,b,8,9 pg 211- 212

Radicals and Dividing

Example 1: State any restrictions (the denominator cannot be 0!) and simplify.

$$\frac{15\sqrt{x^3}}{-3\sqrt{x^2}}$$

$$\frac{6\sqrt{5} - 2\sqrt{24x^3}}{2\sqrt{x}}$$

#4, 6, 8, 9, 10 pg 212-213