

5.1 Working With Radicals (II)

Review: $2x$ and $-5x$ are **like terms** and $2x - 5x = -3x$

$2x$ and $-5y$ are **unlike terms** and $2x - 5y = 2x - 5y$

We can extend this thinking with radicals. When adding and subtracting radicals, we are only able to combine like radicals.

$$2\sqrt{3} - 6\sqrt{3} = -4\sqrt{3} \quad \text{and}$$

$$2\sqrt{5} + 6\sqrt{3} = 2\sqrt{5} + 6\sqrt{3}$$

Example: Simplify each expression. Identify any restrictions in the variables.

a) $2\sqrt{7} + 13\sqrt{7}$
 $= 15\sqrt{7}$

b) $\sqrt{24} - \sqrt{6}$
 $= 2\sqrt{6} - 1\sqrt{6}$
 $= \sqrt{6}$

c) $\sqrt{20x} - 3\sqrt{45x}$
 $= 2\sqrt{5x} - 9\sqrt{5x}$
 $= -7\sqrt{5x}, \quad x \geq 0$

d) $2\sqrt{27} + 2\sqrt{75}$
 $= 6\sqrt{3} + 10\sqrt{3}$
 $= 18\sqrt{3}$

e) $2\sqrt{48} + 16\sqrt{10} - \sqrt{75} + \sqrt{10}$
 $= 8\sqrt{3} + 16\sqrt{10} - 5\sqrt{3} + \sqrt{10}$
 $= 3\sqrt{3} + 17\sqrt{10}$

$$f) 3\sqrt{32a} - 4\sqrt{162a}$$

$$= 12\sqrt{2a} - 36\sqrt{2a}$$

$$= -24\sqrt{2a}, a \geq 0$$

$$g) \sqrt[3]{128x^4} + 4\sqrt[3]{16x}$$

$$= 4x\sqrt[3]{2x} + 8\sqrt[3]{2x}$$

$$= (4x+8)\sqrt[3]{2x}$$

$$\text{or}$$
$$= \sqrt[3]{2x}(4x+8)$$

$$= 4\sqrt[3]{2x}(x+2),$$

$$x \in \mathbb{R}$$