4.3

Adding/Subtracting with Radical Expressions

Date: _____

After this lesson and practice, I will be able to …

- ☐ add and subtract radical expressions. (LT 5)
- ☐ ~~multiply and rationalize binomial radical expressions. (LT 6)~~

In your studies with quadratics and polynomials, several of your solutions to quadratic equations were in the form of a simplified radical expression. Examples of these are: $4\sqrt{2}$ or $i\sqrt{37}$

In today's lesson, you will learn how to perform the ~~four~~ two major operations with these expressions.

Adding and Subtracting Radical Expressions (LT 5)

Just as ~~like~~ certain terms can only be added or subtracted if they are like terms, radical expressions can be added or subtracted only if they are like radicals.

Definition 1: **Like Radicals –** Radical expressions that have the same index and the same radicand (the # under the radical.)

LIKE RADICALS OR NOT?!

A) $6\sqrt[3]{11}, 2\sqrt[3]{11}$ YES

B) $6\sqrt[3]{11}, 2\sqrt{11}$ NO — ~~index~~ indices not same

C) $5\sqrt{7}, 3\sqrt{7}$ YES

D) $5\sqrt{7}, 3\sqrt{2}$ NO — radicands not same

Example 1: Add or subtract, if possible.

A) $5\sqrt[3]{x} - 3\sqrt[3]{x}$

$2\sqrt[3]{x}$

B) $4\sqrt{2} + 4\sqrt{3}$

cannot be simplified

When possible, you should simplify radicals before adding or subtracting so that you can see all of the like radicals.

Example 2: Simplify $6\sqrt{18} + 4\sqrt{8} - 3\sqrt{72}$.

$6 \cdot 3\sqrt{2} + 4 \cdot 2\sqrt{2} - 3 \cdot 6\sqrt{2}$

$18\sqrt{2} + 8\sqrt{2} - 18\sqrt{2}$

$8\sqrt{2}$

18 → 9, 2 → 3, 3 ; $\sqrt{18} = 3\sqrt{2}$

8 → 4, 2 → 2, 2 ; $\sqrt{8} = 2\sqrt{2}$

72 → 6, 12 → 2, 3, 3, 4 → 2, 2 ; $\sqrt{2 \cdot 2 \cdot 2 \cdot 3 \cdot 3}$; $6\sqrt{2}$

Example 3: Simplify each radical expression, if possible.

A) $6\sqrt{3} + 5\sqrt{3}$ $11\sqrt{3}$

B) $2\sqrt{3} - 8\sqrt{32}$ $2\sqrt{3} - 8 \cdot 4\sqrt{2}$ $2\sqrt{3} - 32\sqrt{2}$

32 → 4, 8 → 2, 2, 2, 4 → 2, 2 ; $\sqrt{2 \cdot 2 \cdot 2 \cdot 2 \cdot 2}$; $4\sqrt{2}$

C) $\sqrt[3]{24} + 5\sqrt[3]{3}$ $2\sqrt[3]{3} + 5\sqrt[3]{3}$ $7\sqrt[3]{3}$

24 → 8, 3 → 4, 2 → 2, 2 ; $\sqrt[3]{2 \cdot 2 \cdot 2 \cdot 3}$; $2\sqrt[3]{3}$

D) $\sqrt{50} - \sqrt{75} + \sqrt{98} + \sqrt{27}$