15.3 Adding and Subtracting Radicals

**Learning Objectives:**
1. Add or subtract like radicals.
2. Simplify square root radical expressions, and then add or subtract any like radicals.
3. Simplify cube root radical expressions, and then add or subtract any like radicals.

1. **Properties for Adding or Subtracting Radicals**

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   1. \( a\sqrt{b} + c\sqrt{b} = (a + c)\sqrt{b} \)
   2. \( a\sqrt{b} - c\sqrt{b} = (a - c)\sqrt{b} \)

   **Example 1.** Add or subtract as indicated.

   1. \( 20\sqrt{5} + 3\sqrt{5} \)

   2. \( 3\sqrt{7} + 5\sqrt{21} - 8\sqrt{21} - 10\sqrt{7} \)

   3. \( \frac{2}{\sqrt{25}} + \frac{2}{\sqrt{9}} \)

2. **Simplify Square Root Radical Expressions, and then Add or Subtract any like Radicals**

   **Example 2.** Add or subtract by first simplifying each radical and then combining any like radicals.
   Assume that all variables represent positive numbers.

   1. \( -10\sqrt{48} - 3\sqrt{75} \)

   2. \( -5\sqrt{8x} + 6\sqrt{18x} \)
3. Simplify Cube Root Radical Expressions, and then Add or Subtract any Like Radicals

Example 3. Add or subtract by first simplifying each radical and then combining any like radicals. Assume that all variables represent positive numbers.

1. \(-3\sqrt[3]{12} + 8\sqrt[3]{12} - 10\)

2. \(\sqrt[3]{128} - 5\sqrt[3]{250}\)