10.5 Adding, Subtracting, and Multiplying Radical Expressions

Learning Objectives:

1. Add or subtract radical expressions.
2. Multiply radical expressions.

Examples:

1. Add or subtract as indicated. Assume that all variables represent positive real numbers.

a) $\sqrt{63}-\sqrt{7}$ b) $-3\sqrt{200}-5\sqrt{8}+9\sqrt{98}$ c) $\sqrt{300x^3}-x\sqrt{12x}$

d) $\sqrt[3]{8x}-\sqrt[3]{27x}$ e) $7\sqrt[3]{x^3y^{13}}+5xy\sqrt[3]{8y^{10}}$ f) $\frac{2\sqrt{2}}{3}+\frac{3\sqrt{2}}{5}$

g) $\frac{2x\sqrt{11}}{5}+\sqrt{\frac{11x^2}{100}}$ h) $10\sqrt[4]{x^7}-2x\sqrt[4]{x^3}$ i) $\sqrt{\frac{20}{x^2}}+\sqrt{\frac{5}{4x^2}}$

2. Multiply. Then simplify if possible. Assume that all variables represent positive real numbers.

a) $\sqrt{6}\left(\sqrt{5}+\sqrt{7}\right)$ b) $\sqrt{7}\left(\sqrt{11}+\sqrt{7}\right)$ c) $\left(\sqrt{7}-\sqrt{2}\right)^2$

d) $\sqrt{2x}\left(\sqrt{2}-\sqrt{x}\right)$ e) $\left(6\sqrt{y}+z\right)\left(3\sqrt{y}-1\right)$ f) $\left(\sqrt[3]{x}+5\right)\left(\sqrt[3]{x}+2\right)$

g) $\left(5\sqrt{3}+9\right)\left(6\sqrt{3}-4\right)$ h) $\left(\sqrt{x-4}+3\right)^2$ i) $\left(\sqrt[3]{x}+7\right)\left(\sqrt[3]{x}-7\sqrt{x}+2\right)$

Answers: 1a) $2\sqrt{7}$ *; b)* $23\sqrt{2}$ *; c)* $8x\sqrt{3x}$ *; d)* $-\sqrt[3]{x}$ *; e)* $17xy^4\sqrt[3]{y}$ *; f)* $\frac{19\sqrt{2}}{15}$ *; g)* $\frac{x\sqrt{11}}{2}$ *; h)* $8x\sqrt[4]{x^3}$ *; i)* $\frac{5\sqrt{5}}{2x}$ *;*
2a) $\sqrt{30}+\sqrt{42}$ *; b)* $\sqrt{77}+7$ *; c)* $9-2\sqrt{14}$ *; d)* $2\sqrt{x}-x\sqrt{2}$ *; e)* $18y+(3z-6)\sqrt{y}-z$ *; f)* $\sqrt[3]{x^2}+7\sqrt[3]{x}+10$ *;*
g) $54+34\sqrt{3}$ *; h)* $x+5+6\sqrt{x-4}$ *; i)* $\sqrt[3]{x^2}-7\sqrt[6]{x^5}+9\sqrt[3]{x}-49\sqrt{x}+14$

10.5 Dividing Radical Expressions **Math 51 Professor Busken**

Objectives

- Rationalize denominators or numerators that have one term
- Terms with different indices

Exercises

4. **Rationalize each denominator. Assume all variables represent positive numbers.**

   a) $\dfrac{6}{2-\sqrt{7}}$ b) $\dfrac{\sqrt{5}+\sqrt{2x}}{\sqrt{5}-\sqrt{2x}}$ c) $\dfrac{3\sqrt{2}+5\sqrt{3}}{5\sqrt{3}-4\sqrt{2}}$

5. **Rationalize each numerator. Assume all variables represent positive numbers.**

   a) $\dfrac{2-\sqrt{11}}{6}$ b) $\dfrac{\sqrt{2}-1}{\sqrt{2}+1}$ c) $\dfrac{\sqrt{8}-\sqrt{3}}{\sqrt{2}+\sqrt{3}}$

6. **Perform the indicated operation. Assume all variables represent positive numbers.**

   a) $\sqrt[3]{x}\sqrt[6]{x}$ b) $\sqrt{xy^3}\sqrt[3]{x^2y}$ c) $\sqrt[4]{xy^2}\left(\sqrt[3]{xy}-\sqrt[5]{x^2y^3}\right.$

Answers: 4a) $-2(2+\sqrt{7})$ 4b) $\frac{5+2\sqrt{10x}+2x}{5-2x}$ 4c) $\frac{35\sqrt{6}+99}{43}$

5a) $\frac{-7}{12+6\sqrt{11}}$ 5b) $\frac{1}{3+2\sqrt{2}}$ 5c) $\frac{5}{7+3\sqrt{6}}$

6a) $\sqrt{x}$ 6b) $xy\sqrt[6]{xy^5}$ 6c) $\sqrt[12]{x^7y^{10}}-y\sqrt[20]{x^{13}y^2}$