

Name: \_\_\_\_\_

Date: \_\_\_\_\_

**Learning Goal 5.3**

Apply order of operations to radical expressions.

Multiply. Simplify the products where possible. State any restrictions on the variable, if any.

$$\begin{aligned} \text{a. } 5\sqrt{3}(\sqrt{6}) &= 5\sqrt{18} \\ &= 5\sqrt{2 \times 9} \\ &= 3 \times 5\sqrt{2} \\ &= 15\sqrt{2} \end{aligned}$$

$$\text{b. } -2\sqrt[3]{11}(4\sqrt[3]{2} - 3\sqrt[3]{3}) = -8\sqrt[3]{22} + 6\sqrt[3]{33}$$

$$\begin{aligned} \text{c. } (4\sqrt{2} + 3)(\sqrt{7} - 5\sqrt{14}) \\ &= 4\sqrt{14} - 20\sqrt{28} + 3\sqrt{7} - 15\sqrt{14} \\ &= -20\sqrt{28} + 3\sqrt{7} - 11\sqrt{14} \\ &= -20\sqrt{4 \times 7} + 3\sqrt{7} - 11\sqrt{14} \\ &= -2 \times 20\sqrt{7} + 3\sqrt{7} - 11\sqrt{14} \\ &= -40\sqrt{7} + 3\sqrt{7} - 11\sqrt{14} \\ &= -37\sqrt{7} - 11\sqrt{14} \end{aligned}$$

$$\begin{aligned} \text{d. } -2\sqrt{11c}(4\sqrt{2c^3} - 3\sqrt{3}) \quad c \geq 0 \\ &= -8\sqrt{22c^4} + 6\sqrt{33c} \\ &= -8c^2\sqrt{22} + 6\sqrt{33c} \end{aligned}$$

Divide. Simplify the products where possible. State any restrictions on the variable, if any.

$$\text{a. } \frac{2\sqrt{51}}{\sqrt{3}} = 2\sqrt{17}$$

$$\begin{aligned} \text{b. } \frac{-7}{2\sqrt[3]{9p}} \times \frac{\sqrt[3]{(9p)^2}}{\sqrt[3]{(9p)^2}} \quad p \geq 0 \\ &= \frac{-7\sqrt[3]{(9p)^2}}{2(9p)} \\ &= \frac{-7\sqrt[3]{81p^2}}{18p} \\ &= \frac{-7\sqrt[3]{(3 \times 27)p^2}}{18p} \\ &= \frac{-(3 \times 7)\sqrt[3]{3p^2}}{18p} \\ &= \frac{-21\sqrt[3]{3p^2}}{18p} \\ &= \frac{-7\sqrt[3]{3p^2}}{6p} \end{aligned}$$

$$\begin{aligned} \text{c.} \quad & \frac{2}{3\sqrt{5}-4} \times \frac{3\sqrt{5}+4}{3\sqrt{5}+4} \\ &= \frac{2(3\sqrt{5}+4)}{(3\sqrt{5}-4)(3\sqrt{5}+4)} \\ &= \frac{2(3\sqrt{5}+4)}{(9 \times 5) + 12\sqrt{5} - 12\sqrt{5} - 16} \\ &= \frac{2(3\sqrt{5}+4)}{45-16} \\ &= \frac{2(3\sqrt{5}+4)}{29} \\ &= \frac{6\sqrt{5}-20}{29} \end{aligned}$$

$$\begin{aligned} \text{d.} \quad & \frac{6}{\sqrt{4x}+1} \times \frac{\sqrt{4x}-1}{\sqrt{4x}-1} \quad x \geq 0 \\ &= \frac{6(\sqrt{4x}-1)}{(\sqrt{4x}+1)(\sqrt{4x}-1)} \\ &= \frac{6(2\sqrt{x}-1)}{\sqrt{16x^2}-\sqrt{4x}+\sqrt{4x}-1} \\ &= \frac{6(2\sqrt{x}-1)}{4x-1} \\ &= \frac{12\sqrt{x}-6}{4x-1} \end{aligned}$$