

Write each expression in simple radical form. Show all work.

$$1. \sqrt[3]{81} - 2\sqrt[3]{24}$$

$$\sqrt[3]{27 \cdot 3} - 2\sqrt[3]{8 \cdot 3}$$

$$3\sqrt[3]{3} - 4\sqrt[3]{3}$$

$$\boxed{-\sqrt[3]{3}}$$

$$2. \frac{15 \cdot \sqrt[3]{5}}{\sqrt[3]{25} \cdot \sqrt[3]{5}}$$

$$\frac{15\sqrt[3]{5}}{5}$$

$$\boxed{3\sqrt[3]{5}}$$

$$3. \frac{(4+\sqrt{2})(5\sqrt{3}-2\sqrt{6})}{(5\sqrt{3}+2\sqrt{6})(5\sqrt{3}-2\sqrt{6})}$$

$$\frac{20\sqrt{3} - 8\sqrt{6} + 5\sqrt{6} - 2\sqrt{12}}{75 - 24}$$

$$\frac{20\sqrt{3} - 3\sqrt{6} - 4\sqrt{3}}{51} = \boxed{\frac{16\sqrt{3} - 3\sqrt{6}}{51}}$$

$$4. \frac{(\sqrt{5}-1)(\sqrt{3}+1)}{(\sqrt{3}-1)(\sqrt{3}+1)}$$

$$\frac{\sqrt{15} + \sqrt{5} - \sqrt{3} - 1}{3-1}$$

$$\boxed{\frac{\sqrt{15} + \sqrt{5} - \sqrt{3} - 1}{2}}$$

$$5. \frac{\left(1 - \frac{1}{\sqrt{2}}\right) \cdot \sqrt{2}}{\left(1 + \frac{1}{\sqrt{2}}\right) \cdot \sqrt{2}}$$

$$\frac{(\sqrt{2}-1)(\sqrt{2}-1)}{(\sqrt{2}+1)(\sqrt{2}-1)}$$

$$\frac{2-2\sqrt{2}+1}{2-1}$$

$$\boxed{3-2\sqrt{2}}$$

$$6. \frac{6(5\sqrt{3}+3\sqrt{2})}{(5\sqrt{3}-3\sqrt{2})(5\sqrt{3}+3\sqrt{2})}$$

$$\frac{30\sqrt{3} + 18\sqrt{2}}{75 - 18}$$

$$\frac{30\sqrt{3} + 18\sqrt{2}}{57}$$

$$\boxed{\frac{10\sqrt{3} + 6\sqrt{2}}{19}}$$

Solve each equation.

$$7. \frac{\sqrt{x-2} + 12 = x - 2}{-12 \quad -12}$$

$$(\sqrt{x-2})^2 = (x-14)^2$$

$$x-2 = x^2 - 28x + 196$$

$$0 = x^2 - 29x + 198$$

$$0 = (x-11)(x-18)$$

$$x = 11, 18$$

$$\boxed{x = 18}$$

11 is extraneous

$$9. \left( 2\sqrt{x} - \sqrt{4x-3} = \frac{1}{\sqrt{4x-3}} \right) \sqrt{4x-3}$$

$$2\sqrt{4x^2-3x} - (4x-3) = 1$$

$$2\sqrt{4x^2-3x} - 4x + 3 = 1$$

$$2\sqrt{4x^2-3x} = 4x - 2$$

$$2(\sqrt{4x^2-3x})^2 = (2x-1)^2$$

$$4x^2 - 3x = 4x^2 - 4x + 1$$

$$x = 1$$

$$\boxed{x = 1}$$

Change

$$8. \sqrt{2x+5} + 2\sqrt{x+6} = 5$$

$$(2\sqrt{x+6})^2 = (5 - \sqrt{2x+5})^2$$

$$4(x+6) = 25 - 10\sqrt{2x+5} + 2x+5$$

$$4x+24 = 2x+30 - 10\sqrt{2x+5}$$

$$(2x-6)^2 = (-10\sqrt{2x+5})^2$$

$$4x^2 - 24x + 36 = 100(2x+5)$$

$$4x^2 - 24x + 36 = 200x + 500$$

$$4x^2 - 224x - 464 = 0$$

$$4(x^2 - 56x - 116) = 0$$

$$4(x-58)(x+2) = 0$$

$$x = 58, -2$$

$$\boxed{x = -2}$$

58 is extraneous

$$10. (\sqrt{x+3})^2 = (x+1)^2$$

$$x+3 = x^2 + 2x + 1$$

$$0 = x^2 + x - 2$$

$$0 = (x+2)(x-1)$$

$$x = -2, 1$$

$$\boxed{x = 1}$$

-2 is extraneous