

## Solving Radical Equations

Step 1: Isolate the radical symbol.

Step 2: Square both sides of the equation.

Step 3: Solve for the variable.

Step 4: Check your solutions.

Directions: Find all solutions to each radical equation. Check your solution in the original equation.

1.  $3\sqrt{x} - 2 = 0$

$$+2 \quad +2$$

$$\frac{3\sqrt{x}}{3} = \frac{2}{3}$$

$$(\sqrt{x})^2 = \left(\frac{2}{3}\right)^2$$

$$\boxed{x = \frac{4}{9}}$$

Check

$$x = \frac{4}{9}$$

$$3\sqrt{x} - 2 = 0$$

$$3\sqrt{\frac{4}{9}} - 2 = 0$$

$$3 \cdot \frac{2}{3} - 2 = 0$$

$$2 - 2 = 0$$

$$0 = 0 \quad \checkmark$$

2.  $\sqrt{x-5} - 4 = 0$

$$+4 \quad +4$$

$$(\sqrt{x-5})^2 = (4)^2$$

$$x - 5 = 16$$

$$+5 \quad +5$$

$$\boxed{x = 21}$$

Check

$$x = 21$$

$$\sqrt{x-5} - 4 = 0$$

$$\sqrt{21-5} - 4 = 0$$

$$\sqrt{16} - 4 = 0$$

$$4 - 4 = 0$$

$$0 = 0 \quad \checkmark$$

$$3. \sqrt{6-x} + 7 = 0$$

$$\begin{array}{r} -7 -7 \\ (\sqrt{6-x})^2 = (-7)^2 \end{array}$$

$$\begin{array}{r} 6-x = 49 \\ -6 \quad -6 \end{array}$$

$$\begin{array}{r} -x = 43 \\ -1 \quad -1 \end{array}$$

$$x = -43$$

No solution

Check  $x = -43$   $\sqrt{6-x} + 7 = 0$

$$\sqrt{6 - (-43)} + 7 = 0$$

$$\sqrt{49} + 7 = 0$$

$$7 + 7 = 0$$

$$14 = 0 \quad X$$

$$4. \sqrt[3]{2x-1} - 3 = 0$$

$$\begin{array}{r} +3 +3 \\ (\sqrt[3]{2x-1})^3 = (3)^3 \end{array}$$

$$\begin{array}{r} 2x-1 = 27 \\ +1 +1 \end{array}$$

$$\begin{array}{r} 2x = 28 \\ \frac{2x}{2} = \frac{28}{2} \end{array}$$

$$\boxed{x = 14}$$

$$5. (\sqrt{x+2})^2 = (\sqrt{3x+4})^2$$

$$\begin{array}{r} x+2 = 3x+4 \\ -x \quad -x \end{array}$$

$$\begin{array}{r} 2 = 2x+4 \\ -4 \quad -4 \end{array}$$

$$\begin{array}{r} -2 = 2x \\ \frac{-2}{2} = \frac{2x}{2} \end{array}$$

$$\boxed{x = -1}$$

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

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

$$\sqrt{1} = \sqrt{-3+4}$$

$$\sqrt{1} = \sqrt{1}$$

$$1 = 1 \quad \checkmark$$

6.  $\sqrt{2x-7}-x=-2$

$$\begin{array}{c} +x \quad +x \\ (\sqrt{2x-7})^2 = (x-2)^2 \end{array}$$

$$2x-7 = (x-2)(x-2)$$

$$2x-7 = x^2 - 2x - 2x + 4$$

$$2x-7 = x^2 - 4x + 4$$

$$\begin{array}{r} -2x+7 \quad \quad -2x+7 \\ \hline \end{array}$$

$$0 = x^2 - 6x + 11$$

$$a=1 \quad b=-6 \quad c=11$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{6 \pm \sqrt{36 - 44 = -8}}{2(1)}$$

$$x = \frac{6 \pm \sqrt{-8}}{2}$$

$$x = \frac{6 \pm 2i\sqrt{2}}{2}$$

NO solution

$$7. \sqrt{x} + \sqrt{x-20} = 10$$

$$-\sqrt{x} \quad -\sqrt{x}$$

$$(\sqrt{x-20})^2 = (10 - \sqrt{x})^2$$

$$x-20 = (10 - \sqrt{x})(10 - \sqrt{x})$$

$$x-20 = 100 - 10\sqrt{x} - 10\sqrt{x} + x$$

$$\cancel{x} - 20 = 100 - 20\sqrt{x} + \cancel{x}$$

$$\cancel{x} - 100 \quad -100 \quad \cancel{x}$$

$$\frac{-120}{-20} = \frac{-20\sqrt{x}}{-20}$$

$$6 = \sqrt{x} \quad \boxed{x=36}$$

Check  $x=36$

$$\sqrt{x} + \sqrt{x-20} = 10$$

$$\sqrt{36} + \sqrt{36-20} = 10$$

$$6 + \sqrt{16} = 10$$

$$6 + 4 = 10$$

$$10 = 10 \checkmark$$

$$8. \sqrt{2x-5} - \sqrt{x-3} = 1 + \sqrt{x-3}$$

$$+\sqrt{x-3}$$

$$(\sqrt{2x-5})^2 = (1 + \sqrt{x-3})^2$$

$$2x-5 = (1 + \sqrt{x-3})(1 + \sqrt{x-3})$$

$$2x-5 = 1 + 1\sqrt{x-3} + 1\sqrt{x-3} + x-3$$

$$2x-5 = -2 + 2\sqrt{x-3} + x$$

$$-x + 2 \quad +2 \quad -x$$

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

$$(x-3)(x-3) = 4(x-3)$$

$$x^2 - 3x - 3x + 9 = 4x - 12$$

$$x^2 - 6x + 9 = 4x - 12$$

$$-4x + 12 \quad -4x + 12$$

$$x^2 - 10x + 21 = 0$$

$$(x-7)(x-3) = 0$$

$$x-7=0 \quad x-3=0$$

$$\boxed{x=7}$$

$$\boxed{x=3}$$

Check

$$\boxed{x=7}$$

$$\sqrt{2x-5} - \sqrt{x-3} = 1$$

$$\sqrt{2 \cdot 7 - 5} - \sqrt{7-3} = 1$$

$$\sqrt{9} - \sqrt{4} = 1$$

$$3 - 2 = 1$$

$$1 = 1 \checkmark$$

$$\boxed{x=3}$$

$$\sqrt{2x-5} - \sqrt{x-3} = 1$$

$$\sqrt{2 \cdot 3 - 5} - \sqrt{3-3} = 1$$

$$\sqrt{1} - \sqrt{0} = 1$$

$$1 - 0 = 1$$

$$1 = 1 \checkmark$$