

6.6 Solve Radical Equations

Radical Equations: Equations that have variables in their radicands.

ex: $\sqrt[3]{2x + 1} = 3$

Solving Radical Equations:

1. Isolate the radical on one side of the equation.
2. Raise each side of the equation to the same power to eliminate the radical.
3. Solve the equation. Check your solution.

Example: Solve and check.

$$\begin{array}{r} \sqrt[3]{x} - 9 = -1 \\ +9 \quad +9 \end{array}$$

$$(\sqrt[3]{x})^3 = (8)^3$$

$$x = 512$$

$$\sqrt[3]{512} - 9$$

$$8 - 9 = -1 \checkmark$$

Example: Solve and check.

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

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

$$x-3 = 16$$

$$x = 19$$

$$2\sqrt[4]{19-3}$$

$$2\sqrt[4]{16}$$

$$2(2) = 4 \checkmark$$

To solve equations with rational exponents

1. Isolate the power.
2. Raise each side to the reciprocal of the rational exponent.
3. Solve and check.

$$\left(x^{3/4}\right)^{4/3} = \left(8\right)^{4/3}$$

$$\frac{2^4}{16}$$

Example: $(x + 5)^{5/2} = 32$

$$x + 5 = 4$$

$$x = -1$$

$$\begin{aligned} (-1 + 5)^{5/2} \\ (4)^{5/2} = 32 \end{aligned}$$

$$\begin{aligned} 2(x + 5)^{5/2} \\ (x + 5)^{3/2} - 7 \end{aligned}$$

Extraneous solutions: a solution that is found by solving an equation that does not work in the original equation.

Example: $(x + 1)^2 = (\sqrt{7x + 15})^2$

$$(x+1)(x+1) = 7x+15$$

$$x^2 + 2x + 1 = 7x + 15$$

$$x^2 - 5x - 14 = 0$$

$$(x-7)(x+2) = 0$$

$$x = 7, \cancel{2}$$

$$x=7 \quad 8 = \sqrt{64} \quad \checkmark$$

$$x=-2 \quad \cancel{-1 = \sqrt{1}}$$

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

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

$$x+6 - 2\sqrt{x+6} - 2\sqrt{x+6} + 4 = x-2$$

$$x+10 - 4\sqrt{x+6} = x-2$$

$$-4\sqrt{x+6} = -12$$

$$\sqrt{x+6} = 3$$

$$x+6 = 9$$

$$x = 3$$

$$\sqrt{9} - 2 = \sqrt{1}$$

$$3 - 2 = 1$$

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31 odd, 45, 47, 51