

Objective: to solve radical equations.

Vocabulary:

Radical Equation: An equation with a radical symbol (square root, cube root, etc.).

Extraneous Solution: A solution that emerges from the process of solving the problem, but is not a valid solution within the context of the problem – it may lead to an undefined or imaginary answer.

Steps for solving radical equations:

1. Isolate the radical on one side of the equation.
2. Square both sides to cancel the radical.
 - Note: You can have two answers when you take the square root of a number.
3. Solve for "x".

Example 2: Solve each of the following radical equations. Be sure to check your solutions.

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

$$\begin{array}{r} 4x^2 = x + 5 \\ -x - 5 \quad -x - 5 \\ \hline 4x^2 - x - 5 = 0 \end{array}$$

$$4x^2 - x - 5 = 0$$

$$(4x-5)(x+1) = 0$$

$$\begin{array}{l} \downarrow \qquad \qquad \downarrow \\ 4x-5=0 \qquad x+1=0 \\ +5+5 \qquad -1-1 \\ \hline 4x=5 \qquad x=-1 \\ \frac{4}{4} \qquad \qquad \qquad \\ x=5/4 \end{array}$$

Roots: $(\frac{5}{4}, 0)$,
 ~~$(-1, 0)$~~

Mult: $-20x^2$
 Add: $-x$

	$4x$	-5
x	$4x^2$	$-5x$
1	$4x$	-5

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

$$(x-3)(x-3) = x+3$$

$$\begin{array}{r} x^2 - 6x + 9 = x + 3 \\ -x \quad -3 \quad -x \quad -3 \\ \hline x^2 - 7x + 6 = 0 \end{array}$$

$$x^2 - 7x + 6 = 0$$

$$(x-6)(x-1) = 0$$

$$\begin{array}{l} \downarrow \qquad \qquad \downarrow \\ x-6=0 \qquad x-1=0 \\ +6+6 \qquad +1+1 \\ \hline x=6 \qquad x=1 \end{array}$$

	x	-3
x	x^2	$-3x$
-3	$-3x$	9

Roots: $(6, 0)$, ~~$(1, 0)$~~

Check:

$$\begin{array}{l} 1-3 = \sqrt{1+3} \\ -2 = \sqrt{4} \\ -2 \neq 2 \quad X \end{array}$$

$$\begin{array}{l} 6-3 = \sqrt{6+3} \\ 3 = \sqrt{9} \\ 3 = 3 \quad \checkmark \end{array}$$

Check:

$$\begin{array}{l} 2(\frac{5}{4}) = \sqrt{(\frac{5}{4})+5} \\ 2.5 = 2.5 \quad \checkmark \end{array}$$

$$\begin{array}{l} 2(-1) = \sqrt{(-1)+5} \\ -2 \neq 2 \quad X \end{array}$$