

## Equations with Variables in Radicals

When both sides of an equation are squared there is no assurance that the resulting equation will be equivalent to the original equation. Consequently it must be assumed that the resulting equation is not equivalent to the original equation.

**When both sides of an equation are squared the solution set of the resulting equation contains the solution set of the original equation.**

1. This means that if both sides of an equation are squared and the resulting equation is solved, those solutions are the only candidates as solutions to the original equation.
2. It also means that if both sides of an equation are squared and the resulting equation is solved, some of those solutions may not be solutions to the original equation.

**Therefore when squaring both sides of an equation is part of the solution process, testing all the possible solutions in the original equation must also be a part of the solution process.**

**Problem 1:** Solve  $\sqrt{2x+9} = x+3$

0 is a solution, -4 is not a solution

**Problem 2:** Solve  $\sqrt{10x+5} - 1 = 2x$

$-\frac{1}{2}$  and 2 are both solutions

**Problem 3:** Solve  $\sqrt{5x+1} - \sqrt{3x} = 1$

Both 0 and 3 are solutions

**Problem 4:** Solve  $\sqrt{3x+1} = 1 + \sqrt{x+4}$

5 is a solution, 0 is not a solution

**Problem 5:** Solve  $\sqrt{2x+5} - \sqrt{x-1} = \sqrt{x+2}$

2 is a solution, but -3 is not a solution

**Problem 6:** Solve  $x = \sqrt{-5x-6}$

Neither -3 nor -2 is a solution. Null set.

**Problem 7:** Solve  $x = \sqrt{5x-6}$

Both 2 and 3 are solutions.  $\{2,3\} \subseteq \{2,3\}$