TSC | WILLIAM D. LAW, JR. LEARNING COMMONS

Solving Radical Equations

Radical equations are equations that contain radical expressions. The radical equations we are going to solve are mainly square root equations and cubic root equations.

Example #1: Solve $\sqrt{x} = 8$

Solution:

The first thing we need to do to solve radical equations is to remove the radical (*n*th roots).

$\sqrt{x} = 8$	To remove the square root on the left side, we will need to square both sides of the equation.
$(\sqrt{x})^2 = (8)^2$	Simplify each side of the equation.
$x=64$	

Check the answer. $x=64$ is the solution.

Example #2: Solve $\sqrt{2x-5} = 3$

Solution:

This equation looks a little different than the previous one. The **radicand** (the expression under the radical sign) of the previous equation is *x*. The radicand of this equation is $2x - 5$. But, if the **radical term** is isolated, we can follow the same steps to solve the equation as mentioned above.

$\sqrt{2x-5} = 3$	To remove the square root on the left side, we will need to square both sides of the equation.
$(\sqrt{2x-5})^2 = 3^2$	Simplify each side of the equation.
$2x - 5 = 9$	Solve for x.
x = 7	Check your answer in original equation.
$\sqrt{2(7)-5} = 3$	$\sqrt{9} = 3$ ✓

Example #3: Solve $\sqrt{2x+8} = x$

Solution: $\sqrt{2x+8} = x$ To remove the square root, square both sides.

$\left(\sqrt{2x+8}\right)^2 = (x)^2$ Simplify each side of the equation.

$2x + 8 = x^2$

$x^2 - 2x - 8 = 0$

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

To solve a quadratic, we need to set the equation equal to zero.

$x - 4 = 0 \quad x + 2 = 0$

$x = 4 \quad x = -2$

Then we can factor & solve for x.

$\sqrt{2(4)+8} = 4$

$\sqrt{16} = 4$

$4 = 4$

We must check the solutions to see if they work. If they are a solution, we will get a true statement when we substitute them into the original equation.

$\sqrt{2(-2)+8} = -2$

$\sqrt{4} = -2$

$2 \neq -2$

We can see that 4 is a solution, but -2 is not.

Exercises: Solve the following radical equations.

1. $\sqrt{3y-1} = 5$ **2.** $\sqrt[3]{x-4} = -2$ **3.** $\sqrt{x+2} = x$

Solutions:

1. $y = \frac{26}{3}$ **2.** $x = -4$ **3.** $x = 2$