

Pre-Calculus 11 Solving Radical Equations

A **radical equation** is an equation that contains at least one radical whose radicand contains a variable. A solution to a radical equation is called the **root** of the equation.

Steps to Solving Radical Equations

1. Isolate the radical with the variable in the radicand
2. Square both sides of the equation (Squaring is the inverse operation of the square root)
3. Check your solutions.

Examples

Solve each equation.

1. $\sqrt{2x} = 4$

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

$$2x = 16$$

$$x = 8$$

check:

$$\begin{aligned} \sqrt{2(8)} &= 4 \\ \sqrt{16} &= 4 \\ 4 &= 4 \checkmark \end{aligned}$$

or restrictions

$$\begin{aligned} 2x &\geq 0 \\ x &\geq 0 \\ 8 &> 0 \checkmark \end{aligned}$$

$$\begin{aligned} \sqrt{2} \cdot \sqrt{2} \\ (\sqrt{2})^2 &= 2 \end{aligned}$$

2. $3\sqrt{x} = 4$

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

$$9x = 16$$

$$x = \frac{16}{9}$$

$$\begin{aligned} x &\geq 0 \\ \frac{16}{9} &> 0 \checkmark \end{aligned}$$

3. $2\sqrt{x+1} - 7 = 13$

$2\sqrt{x+1} = 20$

$\sqrt{x+1} = 10$

$(\sqrt{x+1})^2 = 10^2$

$x+1 = 100$

$x = 99$

isolate the radical

square both sides

check:
 $2\sqrt{99+1} - 7 = 13$?

$2\sqrt{100} - 7 = 13$

$2(10) - 7 = 13$

$13 = 13$ ✓

or restrictions

$\sqrt{x+1} = 10$

consider both sides

$x+1 \geq 0$ and $10 \geq 0$ ✓

$x \geq -1$

$99 > -1$ ✓

4) $4\sqrt{x+3} = 5\sqrt{x+1}$

$2 = \sqrt{x}$

$4 = x$

restrictions

$2 = \sqrt{x}$

$2 \geq 0$ and $x \geq 0$

✓

$4 > 0$ ✓

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6a, c, e

7b, d, f

9a, b