

Pre-AP Algebra II  
Notes Day # 99  
Solving Radical Equations & Inequalities

SOLVING RADICAL EQUATIONS

**REVIEW:** Radical Equations include radical expressions. We can solve a radical equation by raising each side of the equation to a power. The steps were shown previously.

**Directions:** Solve the following equations. Check for extraneous solutions.

Ex. 1:  $\sqrt{x-4} = 3$

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

$$\begin{array}{r} x-4 = 9 \\ +4 \quad +4 \\ \hline \end{array}$$

x = 13

**CHECK:**

$$\sqrt{x-4} = 3$$

check x = 13

$$\sqrt{13-4} = 3$$

$$\sqrt{9} = 3$$

$$3 = 3 \checkmark$$

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

$$(\sqrt[3]{2x+1})^3 = (3)^3$$

$$\begin{array}{r} 2x+1 = 27 \\ -1 \quad -1 \\ \hline \end{array}$$

$$\frac{2x}{2} = \frac{26}{2}$$

x = 13

**CHECK:**

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

check x = 13

$$\sqrt[3]{2(13)+1} = 3$$

$$\sqrt[3]{26+1} = 3$$

$$\sqrt[3]{27} = 3$$

$$3 = 3 \checkmark$$

Ex. 3:  $\sqrt[3]{2x+1} = -3$

$$(\sqrt[3]{2x+1})^3 = (-3)^3$$

$$\begin{array}{r} 2x+1 = -27 \\ -1 \quad -1 \\ \hline \end{array}$$

$$\frac{2x}{2} = \frac{-28}{2}$$

x = -14

Note: all odd index solutions will work

## SOLVING RADICAL INEQUALITIES

A radical inequality has a variable in the radicand. To solve radical inequalities, complete the following steps.

### Steps for Solving Radical Inequalities

- Step 1:** If the index of the root is even, identify the values of the variable for the radicand is nonnegative.
- Step 2:** Solve the inequality algebraically.
- Step 3:** Test values to check your solution.

Ex. 4:

$$\sqrt{2x+2} + 1 \geq 5$$

→ must be greater than zero or equal  
(negatives will be imaginary)

$$\frac{2x+2 \geq 0}{-2 \quad -2}$$

$$\frac{2x \geq -2}{2 \quad 2}$$

•  $x \geq -1$

$$\frac{\sqrt{2x+2} + 1 \geq 5}{-1 \quad -1}$$

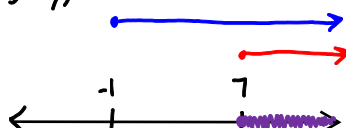
$$\sqrt{2x+2} \geq 4$$

$$(\sqrt{2x+2})^2 \geq (4)^2$$

$$\frac{2x+2 \geq 16}{-2 \quad -2}$$

$$\frac{2x \geq 14}{2 \quad 2}$$

•  $x \geq 7$



$x \geq 7$

**CHECK:**

Check  $x = -2$

$$\sqrt{2x+2} + 1 \geq 5$$

$$\sqrt{2(-2)+2} + 1 \geq 5$$

$$\sqrt{-4+2} + 1 \geq 5$$

$$\sqrt{-2} + 1 \geq 5 \quad \times$$

imaginary

Check  $x = 0$

$$\sqrt{2x+2} + 1 \geq 5$$

$$\sqrt{2(0)+2} + 1 \geq 5$$

$$\sqrt{0+2} + 1 \geq 5$$

$$\sqrt{2} + 1 \geq 5$$

↗  $\sqrt{1} < \sqrt{2} < \sqrt{4}$   
 $1 < \sqrt{2} < 2$   
between 1 and 2  
+1  
between 2 and 3  $\geq 5 \quad \times$

Check  $x = 7$

$$\sqrt{2x+2} + 1 \geq 5$$

$$\sqrt{2(7)+2} + 1 \geq 5$$

$$\sqrt{14+2} + 1 \geq 5$$

$$\sqrt{16} + 1 \geq 5$$

↗  $4+1 \geq 5$   
 $5 \geq 5 \quad \checkmark$

Ex. 5:

$$\sqrt{4x-4} - 2 < 4$$

$$\frac{4x-4 \geq 0}{+4 \quad +4}$$

$$\frac{4x \geq 4}{4 \quad 4}$$

•  $x \geq 1$

$$\frac{\sqrt{4x-4} - 2 < 4}{+2 \quad +2}$$

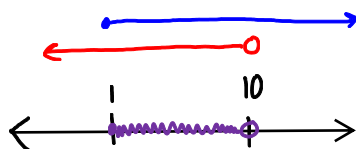
$$\sqrt{4x-4} < 6$$

$$(\sqrt{4x-4})^2 < (6)^2$$

$$\frac{4x-4 < 36}{+4 \quad +4}$$

$$\frac{4x < 40}{4 \quad 4}$$

•  $x < 10$



$1 \leq x < 10$

**CHECK:**

Check  $x = 0$

$$\sqrt{4x-4} - 2 < 4$$

$$\sqrt{4(0)-4} - 2 < 4$$

$$\sqrt{0-4} - 2 < 4$$

$$\sqrt{-4} - 2 < 4 \quad \times$$

imaginary

Check  $x = 2$

$$\sqrt{4x-4} - 2 < 4$$

$$\sqrt{4(2)-4} - 2 < 4$$

$$\sqrt{8-4} - 2 < 4$$

$$\sqrt{4} - 2 < 4$$

$$2 - 2 < 4$$

$$0 < 4 \quad \checkmark$$

Check  $x = 11$

$$\sqrt{4x-4} - 2 < 4$$

$$\sqrt{4(11)-4} - 2 < 4$$

$$\sqrt{44-4} - 2 < 4$$

$$\sqrt{40} - 2 < 4$$

↗  $\sqrt{36} < \sqrt{40} < \sqrt{49}$   
 $6 < \sqrt{40} < 7$   
(between 6 and 7)  $-2 < 4$   
(between 4 and 5)  $< 4 \quad \times$