

Key

# 6.7 Solving Radical Equations & Inequalities - Day 1 Notes

Objective: Solving radical equations

### Steps for solving radical equations:

1. Isolate radical on one side of the equation.
2. Raise each side of the equation to the power of the index of the radical.
3. Solve the resulting polynomial equation.
4. Check your answer.

Always Check for extraneous solutions! (one that doesn't answer the original equation.)

Solve.

Ex #1  $2\sqrt{4x+8}-4=8$

Step 1:  $\frac{2\sqrt{4x+8}}{2} = \frac{12}{2}$

Step 2:  $(\sqrt{4x+8})^2 = 6^2$   
 $4x+8=36$   
 $\frac{4x}{4} = \frac{28}{4}$   $x=7$

1.  $2\sqrt{3x+4}+1=15$

Step 1:  $\frac{2\sqrt{3x+4}}{2} = \frac{14}{2}$

Step 2:  $(\sqrt{3x+4})^2 = 7^2$   
 $3x+4=49$   
 $\frac{3x}{3} = \frac{45}{3}$   $x=15$

Ex.#2  $\sqrt[3]{x-5} = -6$

Step 1:  $\sqrt[3]{x-5} = -6$

Step 2:  $(x-5)^{\frac{1}{3} \cdot 3} = (-6)^3$   
 $x-5 = -216$   
 $\frac{x-5}{+5} = \frac{-216}{+5}$   
 $x = -211$

↑ odd index root so neg. # is okay

2.  $(6u-5)^{\frac{1}{3}} + 2 = -3$

$(6u-5)^{\frac{1}{3} \cdot 3} = (-5)^3$

$6u-5 = -125$   
 $\frac{6u-5}{+5} = \frac{-125}{+5}$   
 $\frac{6u}{6} = \frac{-130}{6}$   $u = -21\frac{5}{6}$

Ex.#3.  $4 + \sqrt{2x-1} = 2$

Step 1:  $\sqrt{2x-1} = -2$

no solution!  
 even index root  $\neq$  neg. #

3.  $8 + \sqrt{x+1} = 4$

$\sqrt{x+1} = -4$

\* no solution!!

check:  $(\sqrt{x+1})^2 = (-4)^2$   
 $x+1 = 16$   
 $x = 15$   
 $\sqrt{15+1} \neq -4$   
 $\sqrt{16} = 4$

$$\text{Ex. \#4 } (\sqrt{4+7x}) = (\sqrt{7x-9})^2$$

$$\begin{array}{r} 4+7x = 7x-9 \\ -7x \quad -7x \\ \hline 4 = -9 \end{array}$$

$$4 \neq -9$$

no solution

$$\text{Ex. \#5 } [(9x-11)^{\frac{1}{2}} = (x+1)]^2$$

$$9x-11 = (x+1)(x+1)$$

$$\begin{array}{r} 9x-11 = x^2+2x+1 \\ -9x+11 \quad -9x+11 \\ \hline 0 = x^2-7x+12 \end{array}$$

$$0 = x^2 - 7x + 12$$

$$0 = (x-3)(x-4)$$

$$x-3=0$$

$$x-4=0$$

$$\checkmark \quad x=3$$

$$\checkmark \quad x=4$$

Check:

$$\sqrt{9(3)-11} = 3+1$$

$$\sqrt{9(4)-11} = 4+1$$

$$\sqrt{27-11} = 4$$

$$\sqrt{36-11} = 5$$

$$\checkmark \quad \sqrt{16} = 4$$

$$\sqrt{25} = 5$$

$x=3$  and  $x=4$

$$4. 2\sqrt{x-11} - \sqrt{x+4} = 0$$

$$(2\sqrt{x-11})^2 = (\sqrt{x+4})^2$$

$$4(x-11) = x+4$$

$$\begin{array}{r} 4x-44 = x+4 \\ +44 \quad +44 \\ \hline 4x = x+48 \end{array}$$

$$\begin{array}{r} 4x = x+48 \\ -x \quad -x \\ \hline 3x = 48 \end{array}$$

$$\frac{3x}{3} = \frac{48}{3}$$

$$x=16$$

$$5. [(x+4)^{\frac{1}{2}} = (x-8)]^2$$

$$x+4 = (x-8)(x-8)$$

$$\begin{array}{r} x+4 = x^2-16x+64 \\ -x-4 \quad -x-4 \\ \hline 0 = x^2-17x+60 \end{array}$$

$$0 = x^2 - 17x + 60$$

$$0 = (x-5)(x-12)$$

$$x-5=0$$

$$x-12=0$$

$$\cancel{x=5}$$

$$x=12 \quad \checkmark$$

Check:

$$\sqrt{5+4} = 5-8$$

$$\sqrt{12+4} = 12-8$$

$$\sqrt{9} \neq -3$$

$$\sqrt{16} = 4$$

$$3 \neq -3$$

$$4 = 4 \quad \checkmark$$

$$x=12$$

GRAVITATION Helena drops a life preserver from 25 feet above a lake. The formula  $t = \frac{1}{4}\sqrt{25-h}$  describes the time  $t$  in seconds that the preserver is  $h$  feet above the water. How many feet above the water will it be after 1 second?

$$t = \frac{1}{4}\sqrt{25-h}$$

$$4(1) = \left(\frac{1}{4}\sqrt{25-h}\right)4$$

$$4^2 = (\sqrt{25-h})^2$$

$$16 = 25-h$$

$$-25 \quad -25$$

$$-9 = -h$$

$h = 9$  feet above the water