## 4 Radical Equations

Monday, February 26, 2024

10:47 AM

## **RADICAL EQUATIONS**

- A radical equation has radical(s) with the variable (e.g., x) in the radicand.
- **Ex**:  $9 \sqrt{x+5} = 2$
- The solution of any equation is all values of the variable that satisfy the equation.
- Since there is a square root of a variable expression, there may be **restrictions** on the radicand. (You can't take the square root of a negative number!)
- To find the <u>restriction</u>: 1) Set the radicand to 0; 2) Isolate x to get restriction on x.
- **Ex**: Given  $9 \sqrt{x+5} = 2$ , set radicand  $x + 5 \ge 0$ . The **restriction** is  $x \ge -5$ .

## SOLVING RADICAL EQUATIONS ALGEBRAICALLY

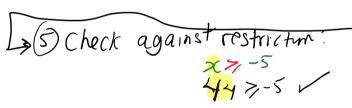
Radical equations are easier to solve without the radical.

o State restrictions on x
o Isolate the square root.

Square both

Square both **Example 1**: Solve  $9 - \sqrt{x+5} = 2$ 

- Square both sides of the equation.
- o Simplify.
- Solve for x.
- Check root against restriction.
- Check root by plugging into equation.



6 (heck by pluggingin  

$$9 - \sqrt{x+5} = 2$$
  
Plugin  $9 - \sqrt{4y+5} = 2$   
 $x = \sqrt{4y}$   $9 - \sqrt{49} = 2$   
 $9 - 7 = 2$ 

$$(\sqrt{x+5})^2 = 7$$

$$(\sqrt{x+5})^2 = 7^2$$

$$\sqrt{(x+5)(x+5)} = 49$$

$$x+5 = 49$$

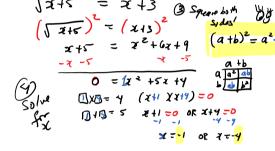
$$\sqrt{9}$$
Solve for  $x = 49$ 

## - fails acheak EXTRANEOUS ROOTS

An extraneous root is a value the algebraic steps may produce as roots; however it does not satisfy the original equation and so cannot be a root. SO ALWAYS CHECK the roots! REJECT any extraneous roots!!

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

- State restrictions on x
- Isolate the square root.
- Square both sides of the equation.
- o Simplify.
- Solve for x.



- Check root against restriction.
  - Oo Check root by plugging into equation.

Check against rostrictum:

6) Cheek by plugging in  $\sqrt{2+5} - 2 = 3$ then x = -1  $\sqrt{4} + 1 = 3$ 

Check  $\sqrt{7+5} - 2 = 3$ 

5 = 3 FALST!

Example 3: Solve 
$$\sqrt{2x-1}-x=-2$$

Restriction:

 $+7 + 4x$ 
 $2x-1 \geqslant 0$ 
 $\sqrt{2x-1} = x-2$ 
 $x \geqslant \frac{1}{2}$ 
 $(\sqrt{2x-1})^2 = (x-2)^2$ 
 $2x-1 = x^2-9x+9$ 
 $-2x+1$ 
 $0 = x^2-6x+5$ 
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Assignment: Solving Radical Equations Worksheet (circled questions)

Solve

Solve a) 
$$\sqrt{x-x^2} + x - 1 = 0$$

b) 
$$19 - 2\sqrt{1-3x} = 11$$

c) 
$$2x - \sqrt{5-2x} = -7$$