

Oct. 18, 2013

Sect. 4-4

Solving Radical Equations

Radical Eqns

Non-Integer Exponent Eqns.

Solve:  $\sqrt{x} = 2$

$$\left(\sqrt{x}\right)^2 = (2)^2 \quad *$$

$$x = 4 \quad \checkmark$$

\* Must check

$$\sqrt{4} \stackrel{?}{=} 2$$

$$2 = 2 \quad \checkmark$$

$$\sqrt{x+5} = 3$$

$$\left(\sqrt{x+5}\right)^2 = (3)^2$$

$$x+5 = 9$$

$$x = 4 \quad \checkmark$$

Check:  $\sqrt{4+5} \stackrel{||}{=} 3$

$$\sqrt{9} \stackrel{||}{=} 3$$

$$3 \stackrel{||}{=} 3 \quad \checkmark$$

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

$$\left(\sqrt[3]{x-1}\right)^3 = (2)^3 \quad *$$

$$x-1 = 8$$

$$x = 9$$

\* No check needed

$$\sqrt{x+5} + 1 = x$$

$$\left(\sqrt{x+5}\right)^2 = \left(x-1\right)^2$$

$$(x-1)(x-1)$$

$$x+5 = x^2 - 2x + 1$$

$$0 = x^2 - 3x - 4 = 0$$

$$(x-4)(x+1) = 0$$

$$x-4=0 \text{ or } x+1=0$$

$$x=4 \text{ or } \cancel{x=-1}$$

$$\{4\}$$

$$\begin{array}{r|l} -4 & \\ \hline 1 & -4 \\ -1 & 4 \\ -2 & 2 \end{array}$$

$$\sqrt{x+5} + 1 = x$$

$$x = 4$$

$$\sqrt{4+5} + 1 \stackrel{?}{=} 4$$

$$\sqrt{9} + 1 \stackrel{?}{=} 4$$

$$3 + 1 \stackrel{?}{=} 4$$

$$4 \stackrel{?}{=} 4 \quad \checkmark$$

~~$$x = -1$$~~

$$\sqrt{-1+5} + 1 \stackrel{?}{=} -1$$

$$\sqrt{4} + 1 \stackrel{?}{=} -1$$

$$2 + 1 \stackrel{?}{=} -1$$

$$3 \stackrel{?}{=} -1 \quad \times$$

$$\begin{aligned}
\sqrt{4x-8} - 1 &= \sqrt{2x-5} \\
\left(\sqrt{4x-8} - 1\right)^2 &= \left(\sqrt{2x-5}\right)^2 \\
\left(\sqrt{4x-8} - 1\right)\left(\sqrt{4x-8} - 1\right) &= 2x-5 \\
(4x-8) - 1\sqrt{4x-8} - 1\sqrt{4x-8} + 1 &= 2x-5 \\
4x-7 - 2\sqrt{4x-8} &= 2x-5 \\
-2\sqrt{4x-8} &= \frac{-2x}{-2} + \frac{2}{-2} \\
\sqrt{4x-8} &= x-1
\end{aligned}$$

$$\left(\sqrt{4x-8}\right)^2 = (x-1)^2$$

$$4x-8 = x^2 - 2x + 1$$

$$x^2 - 6x + 9 = 0$$

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

$$x-3 = 0$$

$$x = 3 \quad \checkmark$$



$$\text{Check: } \sqrt{4x-8} - 1 = \sqrt{2x-5}$$

$$\sqrt{4(3)-8} - 1 \stackrel{?}{=} \sqrt{2(3)-5}$$

$$\sqrt{12-8} - 1 \stackrel{?}{=} \sqrt{6-5}$$

$$\sqrt{4} - 1 \stackrel{?}{=} \sqrt{1}$$

$$2 - 1 \stackrel{?}{=} 1$$

$$1 \stackrel{?}{=} 1$$

$$1 \checkmark$$

$$(x-1)^{\frac{1}{2}} = \infty$$

$$\left[ (x-1)^{\frac{1}{2}} \right]^{\frac{1}{2}} = \left[ \infty \right]^{\frac{1}{2}}$$

\*  
Must  
Check

$$x-1 = 4$$

$$x = 5 \quad \checkmark$$

Check:

$$(5-1)^{\frac{1}{2}} = \infty$$

$$4^{\frac{1}{2}} = \infty$$

$$\infty = \infty \quad \checkmark$$

$$(x+4)^{\sqrt{2}} = 9$$

$$\left[ (x+4)^{\sqrt{2}} \right]^{\sqrt{2}} = \left[ 9 \right]^{\sqrt{2}}$$

$$x+4 = \pm 27$$

$$x+4=27 \quad \text{or} \quad x+4=-27$$

$$x=23 \quad \text{or} \quad x=-31$$

$$x^2 = 9$$

$$\sqrt{x^2} = \pm \sqrt{9}$$

$$x = \pm 3$$

\* No check needed