7.5 Solving Square Root and other Radical Equations

A radical equation is an equation that has a variable ***inside*** a radicand.

$3+\sqrt{x}=10$ $\sqrt{3}+x=10$

Which one of these is a radical equation?

In order to solve a radical equation, you first need to isolate the radical on one side of the equation.

Solve the following square root equations:

$2+\sqrt{3x-2}=6$

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

$3x-2=16$

$3x=18$

$x=6$

$\sqrt{5x+1}-6=0$

$(\sqrt{5x+1})^2=(6)^2$

$5x+1=36$

$5x=35$

$x=7$

Solving radical equations with rational exponents:

$2(x-2)^{\frac{2}{3}} = 50$

$(x-2)^{\frac{2}{3}\cdot\frac{3}{2}} = 25^{\frac{3}{2}}$

$\frac{2}{3}\cdot\frac{3}{2} = 1$

$x-2 = \sqrt{25}^{3}$

$x-2 = 5^{3}$

$x-2 = 125$

$x = 127$

$2(x+3)^{\frac{3}{2}} = 54$

$(x+3)^{3/2\ \cdot\ 2/3} = 27^{2/3}$

$x+3 = \sqrt[3]{27}^{2}$

$x+3 = 3^{2}$

$x+3 = 9$

$x = 6$

Checking for EXTRANEOUS solutions:

It looks like it's a solution, but it's not!

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

$(\sqrt{x-3})^2=(x-5)^2$

$x-3=(x-5)(x-5)$

$x-3=x^2-10x+25$

$0=x^2-11x+28$

$(x-7)(x-4)$

$x=7$ $\quad x\neq 4$

$\sqrt{5x-1}+3=x$

$(\sqrt{5x-1})^2=(x-3)^2$

$5x-1=(x-3)(x-3)$

$5x-1=x^2-6x+9$

$0=x^2-11x+10$

$(x-10)(x-1)$

$x=10$ $\quad x\neq 1$

Solving equations with 2 rational exponents:

$$(2x+1)^{0.5} - (3x+4)^{0.25} = 0$$

$$(2x+1)^{\frac{1}{2}\cdot\frac{4}{1}} = (3x+4)^{\frac{1}{4}\cdot\frac{4}{1}}$$

$$(2x+1)^2 = 3x+4$$

$$(2x+1)(2x+1) = 3x+4$$

$$4x^2+4x+1 = 3x+4$$

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

$$(4x-3)(x+1)$$

$x = 3/4$

$x = -1$

$\frac{1}{2}\cdot\frac{4}{1} = 2$

$\frac{1}{4}\cdot\frac{4}{1} = 1$

$$\sqrt{3x+2} - \sqrt{2x+7} = 0$$

$$\left(\sqrt{3x+2}\right)^2 = \left(\sqrt{2x+7}\right)^2$$

$$3x+2 = 2x+7$$

$$3x = 2x+5$$

$x = 5$

Homework:

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#'s 1 - 12 even/odd
15 - 30 even/odd