Solving Radical Equations

variable inside radical

1. Isolate the radical! ****

2. Square (or cube, etc) both sides.

3. Solve.

4. Check for extraneous solutions!!!!

1. $\sqrt{4x+8}+9=11$

$-9 \quad -9$

$(\sqrt{4x+8})^2=(2)^2$ ← isolate radical

$4x+8=4$ ← square both sides

$4x=-4$

$x=-1$ } ← solve

Check:

$\sqrt{4(-1)+8}+9=11$

$\sqrt{4}+9=11$

$2+9=11$ ✓

2. $\sqrt{5x-7}-\sqrt{6x+2}=0$

$(\sqrt{5x-7})^2=(\sqrt{6x+2})^2$ ← isolate both $\sqrt{}$

$5x-7=6x+2$ ← Square both sides

$-9=x$ ← Solve

$\varnothing$

Check:

$\sqrt{5(-9)-7}=$

$\sqrt{-52}$

3. $x-x\sqrt{7}=3$ ← This is a linear equation! $\sqrt{7}$ is an irrational coefficient

$1x-\sqrt{7}\cdot x=3$

$\frac{(1-\sqrt{7})\cdot x}{(1-\sqrt{7})}=\frac{3}{(1-\sqrt{7})}$

$x=\frac{3}{(1-\sqrt{7})}\cdot\frac{(1+\sqrt{7})}{(1+\sqrt{7})}=\frac{3(1+\sqrt{7})}{-6}$

$1+\sqrt{7}-\sqrt{7}-\sqrt{49}$

$=\frac{1+\sqrt{7}}{-2}=-\frac{1-\sqrt{7}}{2}$

$=-\frac{1}{2}-\frac{\sqrt{7}}{2}$

4. $-2\sqrt{9x+5}-9=-21$

$+9 \quad +9$

$\frac{-2\sqrt{9x+5}}{-2}=\frac{-12}{-2}$ } isolate $\sqrt{\ }$

$\left(\sqrt{9x+5}\right)^2=(6)^2$ ← sqr. both sides

$9x+5=36$

$9x=31$

$x=\frac{31}{9}$ } Solve

Check:

$-2\sqrt{9\cdot\frac{31}{9}+5}-9=-21$

$-2(6)-9=-21$

✓

5. $\sqrt[3]{x-1}+4=3$

$-4 \quad -1$

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

$x-1=-1$

$x=0$

Check:

$\sqrt[3]{-1}+4=3$

$-1+4=3$

✓

6. $\left(\sqrt{4x+5}\right)^2 = (x)^2$

$4x+5 = x^2$

$0 = x^2 - 4x - 5$

$0 = (x-5)(x+1)$

$x = 5$ $\quad$ ~~$x = -1$~~

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

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

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

$x^2 + 5x + 4 = 0$

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

~~$x = -4$~~ $\quad$ $x = -1$