

Adding and Subtracting Radicals

How hard can adding be?

You just have to remember that you can't take the square root of a negative number! Not yet...

State the restriction:

$$\sqrt{4-x}$$

$$4-x > 0$$

$$4 \geq x$$

~~$$\sqrt{2-3}$$~~

$$\sqrt{2-x}$$

$$2-x \geq 0$$

$$2 \geq x$$

Solve:

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

Here are the steps you want to follow every time you have a radical in your expression:

1. Isolate the radical
 - Get the root alone on one side of the equation
2. Square both sides
 - This gets rid of the radical. Back to easy mode after this!
3. Solve for x
4. Check for extraneous roots
 - Sometimes you may find answers that are not allowed.

Non Permissible Values (NPV)

$$\begin{array}{l|l} (\sqrt{x+1})^2 = (5-3)^2 & x+1 \geq 0 \\ x+1 = 4 & x \geq -1 \\ x = 3 \quad \checkmark & \end{array}$$

$$x = \sqrt{x+10} + 2$$

$$(x-2)^2 = (\sqrt{x+10})^2$$

$$x^2 - 4x + 4 = x + 10$$

$$x^2 - 4x - x = 10 - 4$$

$$x^2 - 5x = 6$$

$$x^2 - 5x - 6 = 0 \quad \checkmark$$

$$\begin{array}{l} m = -3, -2 \\ n = 6 \end{array}$$

When you square both sides of an equation, you are destroying information about the signs of the two sides. Now we have a new equation. Both answers may work in that equation, but we need to check our original equation to see that it works in there too!

$$\begin{aligned} x+2 &\geq 0 \\ x &\geq -2 \end{aligned}$$

$$\begin{aligned} x - \sqrt{x+2} &= 0 \\ (x)^2 &= (\sqrt{x+2})^2 \\ x^2 &= x+2 \\ x^2 - x - 2 &= 0 \\ (x-2)(x+1) &= 0 \end{aligned}$$

$$\begin{aligned} m &\rightarrow -2 \\ a &\rightarrow -1 \\ -2 &+ (\\ (x-2)(x+1) \end{aligned}$$

$$\begin{aligned} x-2 &= 0 \\ x &= 2 \end{aligned}$$

or

$$\begin{aligned} x+1 &= 0 \\ x &= -1 \end{aligned}$$

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#1,3-6,7ab,8,12

$$\frac{6}{\sqrt{5} + 2\sqrt{2}} \cdot \frac{\sqrt{5} - 2\sqrt{2}}{\sqrt{5} - 2\sqrt{2}}$$

$$\begin{aligned} &= \frac{6\sqrt{5} - 6(2)\sqrt{2}}{\sqrt{5}\cdot\sqrt{5} - 2\sqrt{5}\cdot 2 + 2\sqrt{2}\cdot\sqrt{5} - 2(2)\sqrt{2}\cdot 2} \\ &\quad \downarrow \\ &\quad 0 \end{aligned}$$

$$= \frac{6\sqrt{5} - 12\sqrt{2}}{5 - 4\sqrt{4}}$$

$$(6\sqrt{2} - 4\sqrt{3})^2$$

$$(6\sqrt{2} - 4\sqrt{3})(6\sqrt{2} - 4\sqrt{3})$$

$$36\sqrt{4} - \underline{24\sqrt{2}\sqrt{3}} - \underline{24\sqrt{2}\sqrt{3}} + \underline{16(13)}$$

$$36\sqrt{4} - 48\sqrt{2}\sqrt{3} + 16(13)$$