• However, one word of warning!

Just plug both $x=0$ and $x=5$ in our original equation:

If $x=0$, $|0| + \sqrt{0+4} - 2 = 0 \Rightarrow 0 + \sqrt{4} - 2 = 0 \Rightarrow$ (A) $2-2=0$

If $x=5$, $|5| + \sqrt{5+4} - 2 = 0 \Rightarrow 5 + \sqrt{9} - 2 = 0 \Rightarrow$ (B) $5+3-2=0$

• As we can see, (A) is correct: $2-2=0=0$.

• However, (B) yields a strange result: $5+3-2 = 8-2 = 6=0$?

Hence, when $x \geq 0$, only $x=0$ is a solution for the equation.

More importantly, why does this happen?

• Because $(x)^2 = (y)^2$ does not necessarily imply $x=y$.

• As we know, both x^2 and $(-x)^2 = x^2$. And, also, $y^2 = (-y)^2 = y^2$.

Hence, when it can potentially be that the left hand side was $-x$, and the right hand side was y:

$$(-x)^2 = (y)^2 \Rightarrow x^2 = y^2.$$

However, LHS is driven by $-x$ and RHS by y.

To see this, just plug numbers. Let's consider $x=y=5$.

$$(-x)^2 = y^2 \Rightarrow (-5)^2 = (5)^2 = 25.$$

However, $\left((-x)^2\right)^{1/2} \neq \left(y^2\right)^{1/2}$, as $\left(-x^2\right)^{1/2} = -5$ and $\left(y^2\right)^{1/2} = 5$.

(*) Always plug your results in original eq. when squaring both sides!