Problem:

Solve the irrational equation:

$\sqrt{x-1}+\sqrt{x+2}=\sqrt{x+34}-\sqrt{x+7}.$

Solution:

$\sqrt{x-1}+\sqrt{x+2}=\sqrt{x+34}-\sqrt{x+7} \Rightarrow (x \geq -7) \Rightarrow \sqrt{x+2}+\sqrt{x+7}=\sqrt{x+37}-\sqrt{x-1},$

let's square both sides of the equation $\Rightarrow$

$x+7+x+2+2\sqrt{(x+2)(x+7)}=x+34+x-1-2\sqrt{(x+34)(x-1)} \Rightarrow$

$\Rightarrow \sqrt{(x+34)(x-1)}=12-\sqrt{(x+2)(x+7)},$

let's square again $\Rightarrow (x+34)(x-1)=144-24\sqrt{(x+2)(x+7)}+(x+2)(x+7) \Rightarrow$

$\Rightarrow 24\sqrt{(x+2)(x+7)}=144+x^2+94+14-x^2-33x+34, \Rightarrow \sqrt{(x+2)(x+7)}=-x+8,$

let's square for the 3rd time $\Rightarrow (x+2)(x+7)=(-x+8)^2 \Rightarrow x^2+9x+14=x^2-16+64 \Rightarrow x=2.$

Now let's check: $\sqrt{1}+\sqrt{4}=\sqrt{36}-\sqrt{9}$ correct.

Answer: $x=2.$