In real variable $x$, consider the equation

$$P \equiv P. \ x := x^2$$

(a) Find 7 distinct solutions for $P$.

Here are six solutions: $x' = 0$ ; $x' > 0$ ; $0 < x' < 1$ ; $x' = 1$ ; $x' > 1$ ; $\bot$. The disjunction of any two solutions is also a solution. For any binary expression $b$ and solutions $A$ and $B$, if $b$ then $A$ else $B$ fi is also a solution.

(b) Which solution does recursive construction give starting from $\top$? Is it the weakest solution?

It gives $x' \geq 0$, which is the weakest solution.

(c) If we add a time variable, which solution does recursive construction give starting from $t' \geq t$? Is it a strongest implementable solution?

It gives $t' = \infty \land x' \geq 0$, which is not a strongest implementable solution because $t' = \infty \land x' = 0$ is a stronger implementable solution.

(d) Now let $x$ be an integer variable, and redo the question.

The solutions are: $x' = 0$ ; $x' = 1$ ; $\bot$; the disjunction of any two solutions is also a solution; for any binary expression $b$ and solutions $A$ and $B$, if $b$ then $A$ else $B$ fi is also a solution. Starting from $\top$ we get $x' = 0 \lor x' = 1$ which is the weakest solution. Starting from $t' \geq t$ we get $t' = \infty \land (x' = 0 \lor x' = 1)$ which is not a strongest implementable solution because $t' = \infty \land x' = 0$ is a stronger implementable solution.