1. The Conjecture is false. For graph

it would return as a longest path from $\sigma$ to $z$ the path of length 2 consisting of the single arc $\{\sigma, z\}$. However, there is a longer simple path from $\sigma$ to $z$ of length 3.

3. function `fixpoint(T[lo..hi])`
   
   if $lo > hi$ then return “$T$ does not contain a fixpoint”
   
   mid ← $(lo + hi)$ div 2
   
   if $T[mid] = mid$ then return mid
   
   if $T[mid] < mid$ then return `fixpoint(T[mid+1..hi])`
   
   else return `fixpoint(T[lo..mid-1])`