• Hints to solutions for HW#4

• Exercise 22.5-3:
  No it does not always produce correct results. Example.
  
  ![Diagram](image)
  
  1 2 3

• Exercise 22.5-7:
  o Call STRONGLY-CONNECTED-COMPONENTS
  o Perform topological sort for all SCC.
  o For all SSCi i=1, 2, 3, 4 .... k, there must be an edge from Vi to Vi+1

• Problem 22-3:
  o A)
    ▪ => Direction: A cycle is simple if it visits each vertex no more than once, and complex if can visit a vertex more than once. Each vertex in a simple cycle indegree and outdegree one. The complex cycles can be expressed as a union of simple cycles => any vertex in a complex cycle has in-degree equal to its outdegree => if a graph has an Euler tour than all of its vertices have equal in and out degrees.
    ▪ <= Direction: if we have a connected graph s.t. the in-degree and out-degree of all V’s are equal. Let C be the longest complex cycle within G. If C is not an Euler tour, then there is a vertex v of G touched by C s.t. not all edges in and out v of are exhausted by C. We may construct a cycle C` in G-C => the complex cycle that starts at v goes along the edges of C` (returning to v) and then goes along the edges of C is a longer complex cycle than C. This contradicts our assumption that C is the longest complex cycle => C has to an Euler tour.
  o B) Approach: Start with a vertex v, and build a cycle from it. Then, find additional cycles and add them to the main one, until all edges have been visited. Time complexity: O(E).