CSC341 Lab 11A

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Academic Honesty

Written Sources Used:

Michael Sipser - Introduction to the Theory of Computation

Help Obtained:

None

Question 1

$O(\log n) \subseteq O(n) \subseteq O(n \log n) \subseteq O(n^2) \subseteq O(n^3) \subseteq O(n!) \subseteq O(n^n)$

Question 2

(1) A list of vertices and a list of edges, where each edge consists of a tuple of two vertices.
Vertices : [1,2,3]
Edges : [(1,2),(2,3),(1,3)]

(2) Assign a truth value to a boolean value using a list of tuples.
[(x_1, true), (x_2, true), (x_3, false)]

(3) List components of a DFA.
States: [s1, s2, s3, s4], Alphabet: [a,b], Start State: s1, Accept State: [s4], Transitions:[(s1,a,s2), (s1,b,s3), (s2,a,s3), (s2,b,s4), (s3,a,s4), (s3,b,s1), (s4,a,s4), (s4,b,s4)]

Question 3

The initial write-up of the state q_0 will take a constant time $O(1)$.
The first sweep, taking the δ portion will take up $O(|\delta|)$ time.
After this, in each iteration checking each transition for each state can take up to $O(|Q|^2 \times |\delta|)$ time in the worst case which means that each state will be checked against all transitions.
Checking if there are no new states takes $O(|Q|)$ time and checking if the WT1 are all accepting states will take also $O(|Q|)$ time.

Overall, since the complexity of the runtime is $O(|Q|^2 \times |\delta|)$, we can say that ALL_{DFA} is in P.

Question 4

(1) For each pair of vertices V' check if they share an edge in G. If they do, return False, else return True.
Checking V' pairs require $O(n^2)$ complexity time ($n = |V'|, n \leq |V|$). The complexity is polynomial.

(2) Check every possible combination of triple vertices in V. If there is a combination, check if they form three separate edges (in the form of (u, v), (v, w), (u, w)). If a triangle is made from these vertices, return True, else False.
This checking of triples take up $O(|V|^3)$ complexity, which is polynomial.