Tutorial 8: CS21003 Algorithms I

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1. Prove that, in an open addressing based hash table, if the size of the table is a prime number greater than 2 and the load factor is at most $\frac{1}{2}$, then the quadratic probing technique of using $h_i(x) = (h(x) + i^2) \mod \text{SIZE}$ finds at least one empty cell.

2. Compare DFS and BFS algorithms in unweighted directed graphs to find each of the following:

   (a) A directed path from node s to node g.

   (b) A directed cycle in the graph.

   Analyse the time complexity in all cases. Which method would you choose for each case and why?

3. Given a weighted acyclic directed graph, develop an algorithm to find all pairs of shortest cost paths. Analyse the time and space complexity of your algorithm .

4. Given an undirected graph, develop an efficient algorithm to find whether there is a path from node s to node g that does not contain both nodes p and q, though it may contain either p or q.