1. Design a global pairwise alignment algorithm for two sequences $A$ of length $m$ and $B$ of length $n$ with a consecutive sequence of $k$ identical matches with the same letter scored as one $\Delta_{\text{match}}$ and $(k - 1) \Delta_{\text{extmatch}}$’s, a mismatch scored as $\Delta_{\text{mismatch}}$, and an indel scored as $\Delta_{\text{indel}}$. Analyze its time complexity.

2. Analyze the amortized complexity of a sequence of $n$ operations on two queues that includes the following three operations: the ENQUEUE operation adds an object to the end of queue 1, the MOVEALL operation moves all the objects from queue 1 to queue 2 by iteratively removing the first object from queue 1 and adding it to queue 2 one by one, and the DEQUEUE operation removes the first object from queue 2.

3. Design an algorithm for the UNION-FIND problem when the size of a set after union is limited to at most a constant $c$ and show that it has improved time complexity.

4. Design an iterative algorithm for depth-first search on an undirected graph and analyze its time complexity.

5. Prove that if an Eulerian path exists in a connected directed acyclic graph that includes each edge in the graph exactly once, the graph consists only of a single linear path.