CSC263 PS3

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1 Question 4

To get the minimum spanning tree after adding the new vertex and it's incident edges to graph $G = (V, E)$, simply run Kruskal's algorithm on the subgraph $G' = (V, E')$ where $E' = \{e_1, \ldots, e_k\} \bigcup E_T$. Note that E_T is the set of edges in the minimum spanning tree T. This algorithm relies on the assumption that the minimum spanning tree of the newly modified graph will only consist of the edges E_T and newly incident edges. If $|E_T| = 1$ then it's obvious that simply adding the only edge in E_T to T would give the minimum spanning tree. If $|E_T| > 1$, then it is possible that adding two edges from $\{e_1, \ldots, e_k\}$ and removing one edge from E' would give you the minimum spanning tree. The time complexity of this algorithm would be $O(VlogV)$ since Kruskal's algorithm's time complexity depends on the number of edges and in our case the number of edges $|E'| \in O(V)$.