1) 20 pts
Mark the following statements as **TRUE** or **FALSE**. No need to provide any justification.

[TRUE/FALSE]
If SAT $\leq_P$ A, then A is NP-hard.

[TRUE/FALSE]
If a problem X can be reduced to a known NP-hard problem, then X must be NP-hard.

[TRUE/FALSE]
If P equals NP, then NP equals NP-complete.

[TRUE/FALSE]
Let X be a decision problem. If we prove that X is in the class NP and give a poly-time reduction from X to Hamiltonian Cycle, we can conclude that X is NP-complete.

[TRUE/FALSE]
The recurrence $T(n) = 2T(n/2) + 3n$, has solution $T(n) = \theta(n \log(n^2))$.

[TRUE/FALSE]
On a connected, directed graph with only positive edge weights, Bellman-Ford runs asymptotically as fast as Dijkstra.

[TRUE/FALSE]
Linear programming is at least as hard as the Max Flow problem in a flow network.

[TRUE/FALSE]
If you are given a maximum s-t flow in a graph then you can find a minimum s-t cut in time O(m) where m is the number of the edges in the graph.

[TRUE/FALSE]
Fibonacci heaps can be used to make Dijkstra's algorithm run in O(|E| + |V| log|V|) time on a graph G=(V,E)

[TRUE/FALSE]
A graph with non-unique edge weights will have at least two minimum spanning trees