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

[TRUE/FALSE]
If P = NP, then all NP-Hard problems can be solved in Polynomial time.

[TRUE/FALSE]
Dynamic Programming approach only works when used on problems with non-overlapping sub problems.

[TRUE/FALSE]
In a divide & conquer algorithm, the size of each sub-problem must be at most half the size of the original problem.

[TRUE/FALSE]
In a 0-1 knapsack problem, a solution that uses up all of the capacity of the knapsack will be optimal.

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

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

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

[TRUE/FALSE]
Consider two positively weighted graphs $G_1 = (V, E, w_1)$ and $G_1 = (V, E, w_2)$ with the same vertices V and edges E such that, for any edge $e \in E$, we have $w_2(e) = (w_1(e))^2$ For any two vertices $u, v \in V$, any shortest path between u and v in G_2 is also a shortest path in G_1.

[TRUE/FALSE]
If an undirected graph G=(V,E) has a Hamiltonian Cycle, then any DFS tree in G has a depth |V| - 1.

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