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

[TRUE]
To prove that a problem X is NP-hard, it is sufficient to prove that SAT is polynomial time reducible to X.

[FALSE]
If a problem Y is polynomial time reducible to X, then a problem X is polynomial time reducible to Y.

[TRUE]
Every problem in NP can be solved in polynomial time by a nondeterministic Turing machine.

[TRUE]
Suppose that a divide and conquer algorithm reduces an instance of size n into 4 instances of size $n/5$ and spends $\Theta(\underline{n})$ time in the conquer steps. The algorithm runs in $\Theta(n)$ time.

[FALSE]
A linear program with all integer coefficients and constants must have an integer optimum solution.

[FALSE]
Let M be a spanning tree of a weighted graph G=(V, E). The path in M between any two vertices must be a shortest path in G.

[TRUE]
A linear program can have an infinite number of optimal solutions.

[TRUE]
Suppose that a Las Vegas algorithm has expected running time $\Theta(n)$ on inputs of size n. Then there may still be an input on which it runs in time $\Omega(n^2)$.

[FALSE]
The total amortized cost of a sequence of n operations gives a lower bound on the total actual cost of the sequence.

[FALSE]
The maximum flow problem can be efficiently solved by dynamic programming.