CS 7910 Computational Complexity
Final Exam

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1. What is NP? What is $NP-Complete$?

   NP stands for Non-Deterministic Polynomial. NP is the set of all problems for which algorithms run in polynomial time on a non-deterministic machine. This machine can be thought of one that can take all possible paths in parallel. On a real machine with finite resources, all NP algorithms will not run in polynomial time (unless if $P = NP$, which is highly unlikely). The set of problems for which algorithms run in polynomial time is called P and $P \subseteq NP$. Another property of NP algorithms is that even though they cannot all run in polynomial time, given a certificate that is a solution to an NP problem, it can be verified in polynomial time that the certificate is correct.

   $NP-Complete$ is the set of the hardest problems in NP. All NP problems can be reduced to $NP-Complete$ problems in polynomial time. Actually if an NP problem can be reduced to another problem, then the resulting problem is said to be in the set $NP-Hard$. The intersection of the sets NP and $NP-Hard$ is the set $NP-Complete$.