# Assignment 7

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## Problem 12

The flaw here is not considering that reducing every CNF in a $k$SAT problem to an equivalent DNF is not done in polynomial time, but in exponential time. The time taken to reduce a CNF problem to an equivalent DNF problem is in $O(k^n)$ where $k$ is the number of literals in each clause and $n$ is the number of clauses. Because of this, the reduction is invalid. This implies that the reasoning of that the SAT problem for CNF is not NP-complete cannot hold. Let $X$ be the SAT problem for CNF and $Y$ be the SAT problem for DNF, then in conclusion $X \leq_p Y$ does not hold.

Another flaw here is to say that the SAT problem is NP-complete when in actuality some SAT problems are not NP-complete. Specifically, it is known that the $k$SAT problem for $k < 3$ are not NP-complete whereas for $k \geq 3$ are. If for any reason it turns out that it is possible to reduce the $k$SAT problem to a different problem in polynomial time, it is not certain that it is solvable in polynomial time for $k > 3$.