

**Your homework will be graded on the neatness of your write up as well as its correctness.**

1. Write a short paragraph explaining how you would prove that for context-free grammars  $G_1$  and  $G_2$ ,  $L(G_1) \cap L(G_2) = \Phi$  is undecidable.
2. Write a short paragraph explaining how you would prove that for a context-free grammar  $G$ ,  $L(G) = \Sigma^*$  is undecidable.
3. Give a polynomial time algorithm to determine if a 2-CNF formula is satisfiable.
4. Write a short paragraph explaining how you would prove that every set in NP is polynomial time reducible to 3-CNF.
5. The vertex cover problem consists of a graph  $G$  and an integer  $n$  and asks if there is a set of  $n$  vertices such that every edge is adjacent to at least one of the vertices in the set. Prove that the vertex cover problem is NP-complete. There are two components to this. The proof is very similar to the proof that the clique problem is NP-complete.