

Week 12

Collaboration: You should work on this problem yourself. **You may not collaborate on the assigned writeup problem with your cohort-mates or anyone else, but you may use notes taken before or during your assessed cohort meeting.**

Problem: 4-SAT

Definition 1 (k-CNF) We say that a formula is in conjunctive normal form (CNF for short) if it is an AND of ORs of variables or their negations. E.g. $(x_7 \vee \overline{x_{22}} \vee x_{15}) \wedge (x_{37} \vee x_{22} \vee \overline{x_7})$ is in CNF. We say that it is k -CNF if there are exactly k variables per clause (group of variables combined with OR).

We know that 3-SAT is in *NP-Complete*, where 3-SAT requires determining whether there exists at least one way to assign Boolean values to each variable in a 3-CNF formula so that the formula evaluates to True.

The 4-SAT problem requires determining whether there exists at least one way to assign Boolean values to each variable in a 4-CNF formula so that the formula evaluates to True.

Prove that 4-SAT is NP-Complete.