Exercise 5

Task 1. Which of the following statements is true provided that $L_1 \leq_m^{\log} L_2$?

- If L_1 is in **P**, then L_2 is in **P**.
- If L_1 is **NL**-hard, then L_2 is **NL**-hard.
- If L_2 is in **L**, then L_1 is in **L**.
- If L_2 is **NP**-complete, then L_1 is **NP**-complete.

Task 2. Show that ACYCLIC (Exercise 4) is NL-complete.

Task 3. Let TAUTOLOGY denote the set of all propositional formulas that evaluate to **true** for all possible assignments of truth values to the variables. Show that TAUTOLOGY is **coNP**-complete.

Task 4. Let 2-CNF denote the set of CNF-formulas with exactly two literals in each clause. Furthermore, let 2-SAT denote the set of satisfiable formulas from 2-CNF. Show that 2-SAT \in **NL**.