CSCI 3333 Practice Quiz PNP

- The actual quiz consists of one question and a 10-minute duration.
- The actual quiz question may or may not be one of the questions here.

Problem 1. Fill in the blanks:

When reducing 2SAT to 3SAT, replace a clause \((x_1 \lor \neg x_2)\) with a clause \((F \lor x_1 \lor \text{literal})\).

When reducing 2SAT to 4SAT, replace a clause \((\neg x_1 \lor x_2)\) with a clause \((F \lor F \lor \text{literal} \lor \text{literal})\).

When reducing 4SAT to 3SAT, replace a clause \((\neg x_1 \lor \neg x_2 \lor x_3 \lor x_4)\) with two clauses \((\neg x_1 \lor \neg x_2 \lor y)\) and \((\text{literal} \lor x_3 \lor \text{literal})\).

When reducing NAE SAT to 3SAT, replace a clause \((\neg x_1 \lor \neg x_2 \lor x_3)\) with two clauses \((\neg x_1 \lor \neg x_2 \lor x_3)\) and \((\text{literal} \lor \text{literal} \lor \text{literal})\).
**Problem 2.** Fill in the blanks in the Venn diagram in Figure 1.

![Venn diagram]

*Figure 1: The Venn diagram for Problem 2.*

**Problem 3.** For each problem, check *all* boxes corresponding to known facts about the problem.

- **Input:** an bipartite undirected graph $G$.
  **Output:** whether $G$ has a perfect matching. 
  - $\square$ In P  
  - $\square$ In NP  
  - $\square$ NP-complete

- **Input:** an undirected graph $G$.
  **Output:** whether $G$ is connected. 
  - $\square$ In P  
  - $\square$ In NP  
  - $\square$ NP-complete

- **Input:** an array of integers $A$.
  **Output:** whether $A$ is sorted. 
  - $\square$ In P  
  - $\square$ In NP  
  - $\square$ NP-complete

- **Input:** a Boolean formula $\Phi$.
  **Output:** whether $\Phi$ has a satisfying assignment. 
  - $\square$ In P  
  - $\square$ In NP  
  - $\square$ NP-complete