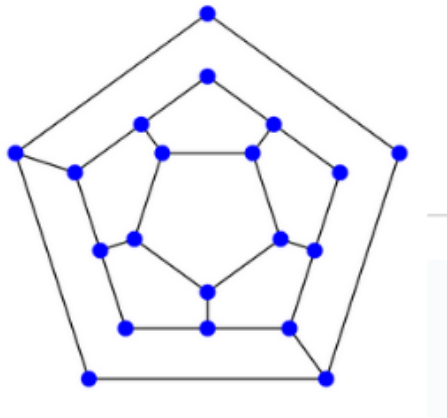# Lab 10

Deadline: 12/11/25

Problem 1. Show that Clique, Independent Set, and Vertex Cover are polynomial-time equivalent by giving reductions between them. (Hint: You don't need six reductions—a cycle of three suffices.)

For a graph G and integer k:

- **Clique**: Does G have a clique of size k?

- **Independent Set**: Does G have an independent set of size k?

- **Vertex Cover**: Does G have a vertex cover of size k?

Problem 2. Does the following graph have a Hamiltonian cycle? If so, give one. If not, explain why.

Problem 3. You have 3 machines and jobs with processing times $[2, 3, 4, 6, 2, 2]$.

(a) Run the following greedy algorithm: assign each job (in the given order) to the currently least-loaded machine. What is the makespan?

(b) Find an optimal assignment. What is the optimal makespan?

(c) Construct an instance where greedy does worse relative to optimal.

(d) For parts (a) and (c), compute the ratio (greedy makespan)/(optimal makespan).

Submit on Gradescope.