CS173 Lecture B, December 3, 2015

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Special graphs

- K_n. The **complete graph**.
- $K_{n,m}$. This is called a **complete bipartite graph**.
- P_n. This is the **path graph** on n vertices.
- C_n. This is the **cycle graph** on n vertices.
- W_n. This is the **wheel graph** on $n+1$ vertices (n in the ring outside, and then 1 in the middle).

Graph-theoretic concepts

- Hamiltonian Path: a path that visits every vertex exactly once
- Hamiltonian Cycle: a cycle that visits every vertex exactly once
- Eulerian walk: a walk that visits every edge exactly once
- Eulerian circuit: a circuit that visits every edge exactly once

Determining if a graph has an Eulerian walk or circuit is easy.
Determining if a graph has a Hamiltonian path or cycle is NP-hard.

Problems

Given a graph, determine:

- If it is Eulerian (has an Eulerian walk or circuit)
- If it is Hamiltonian (has an Hamiltonian path or cycle)
- The chromatic number
- A largest clique, largest independent set, and largest matching
- A smallest dominating set and a smallest vertex cover
- Breadth-first search tree starting from some node

Try this

Try finding the optimal clique, dominating set, vertex coloring, maximum matching, etc., on one of these graphs:
$K_{3,3}, K_{4,3}, K_4, P_4, P_5, C_4, C_5, W_5, W_6$

Examlet

One of the problems in the examlet is to provide a proof by contradiction that some set is uncountable. This means you need to show the proof based on a diagonalization argument. Don't just cite a theorem that says this set is uncountable.