## Graphs and Algorithms

## Exercise 1 (Hamiltonian Graphs)

Let G be a graph on n vertices. Prove that G is Hamiltonian if for all non-adjacent vertices u, v we have  $\deg(u) + \deg(v) \ge n$ .

## Exercise 2 (Hamilton Paths in Tournaments)

An oriented complete graph is called a *tournament*. Show that every tournament contains a Hamilton path, i.e., a path that visits every vertex exactly once. How many Hamilton paths are there in an acyclic tournament (a tournament without directed cycles)?

## Exercise 3 (Adjacency Matrix)

Given the matrix  $A^3$ , where A is the adjacency matrix of a graph G, calculate the number of triangles in G. How would you get the number of cycles of length 4 in G from powers of A?

DISCUSSION OF THE SOLUTION IN THE EXERCISE CLASS ON 18.4.2013.