Math 140: Thursday Aug 29, Day 4 Notes

Agenda for Thursday, Aug 29,2024

Reminders

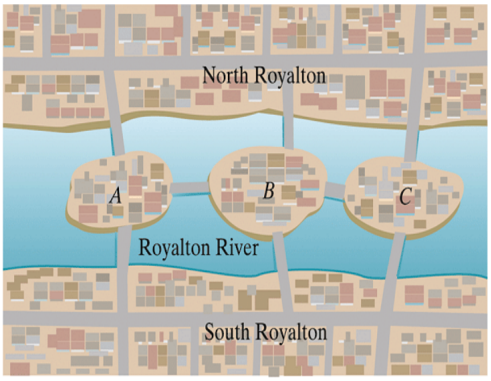
- ! Turn in **Written HW 1** by end of today (upload in Canvas or bring to class)
- **Online Homework 1 - Euler Circuits and Paths** due by next Thursday
- Office Hour **today 1-2:15pm** in C162
- **First Group Quiz** today in class (you can use your handwritten notes)
- **Student Resource Fair** today from 11:30 a.m.-1:30 p.m. & 4:30-6 p.m. Student Commons/Student Street

Eulerization and Semi-Eulerization

Recall:
What do you do if a graph doesn't have an Euler Circuit or an Euler Path but you still need to travel all the edges?

Applications of Eulerization and Semi-Eulerization

Example 1. Here is a map of downtown Royalton, showing the Royalton River running through the downtown area and the three islands (A, B, and C) connected to each other and both banks by eight bridges. The Downtown Athletic Club wants to design the route for a marathon through the downtown area.



a) Find the circuit for the marathon that has its start and finish at South Royalton.

b) Find the path for the marathon that has its start at South Royalton and end at North Royalton.

Section 1.3 Hamiltonian Circuits and Paths

Hamiltonian Path - A path that visits _____ exactly once.

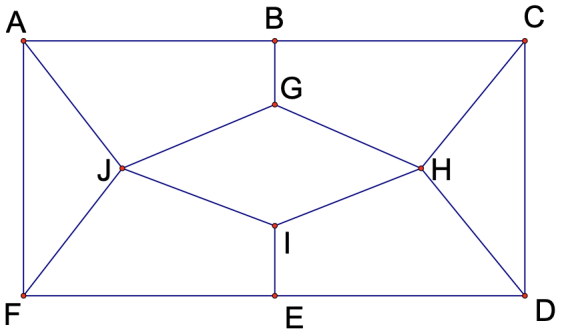
Hamiltonian circuit - A circuit in a graph is a path that starts and ends at the _____ vertex and passes through all other _____ exactly once.

Question: What is the difference between a Hamilton Path and an Euler Path?

Notes:

1. A graph can't have both an Euler circuit and an Euler path.
2. A graph that has a Hamilton Circuit has a Hamilton Path.

Example 2. Consider the following graph.



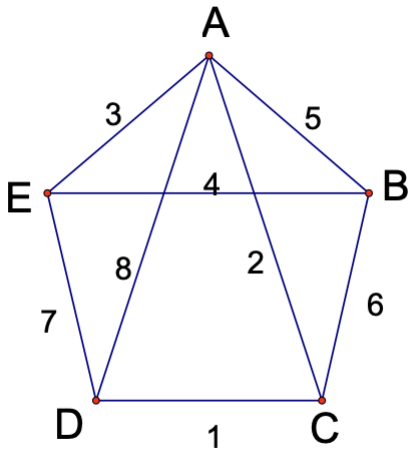
1. Find two different Hamilton Circuits.

2. Find a Hamilton Path that starts at A and ends at B.

3. Find a Hamilton Path that starts at F and ends at I.

Weighted graph A weighted graph has _____ associated with edges. The _____ are called weights and could represent cost, distance, time, etc.

Example 3. Consider the following graph.



a) What is the weight of AD?

b) What is the weight of the Hamilton Circuit ABCDEA?

c) What is the weight of the Hamilton Circuit ACDEBA?

Complete graph A graph in which every pair of distinct vertices is joined by an _____. If you have N vertices, K_N denotes the complete graph.

Factorial:

! Formula for the number of edges in a complete graph with N vertices:

Table with info about complete graphs

! Formula for the number of Hamilton Circuits in the complete graph K_N:

Example 4. For a complete graph with 10 vertices, how many Hamilton Circuits are there?

Example 5. If K_N has 40,320 Hamilton Circuits, what is N?