

Math 140: Thursday Aug 29, Day 4 Notes

Agenda for Thursday, Aug 29, 2024

Eulerization and Semi-Eulerization	1
Section 1.3 Hamiltonian Circuits and Paths	3
Group Quiz 1	6

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

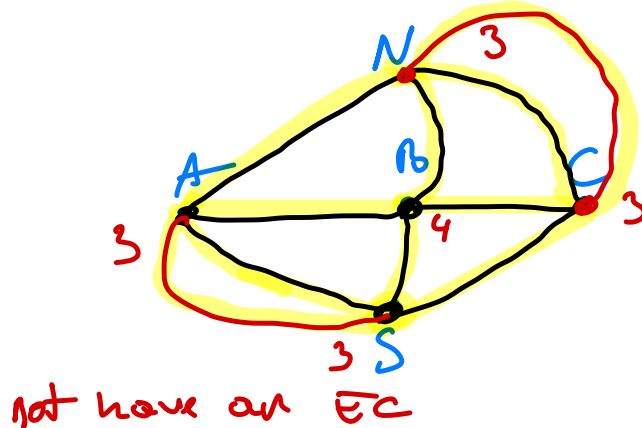
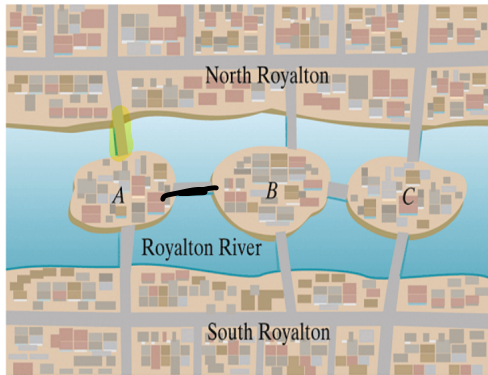
Eulerization and Semi-Eulerization

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.

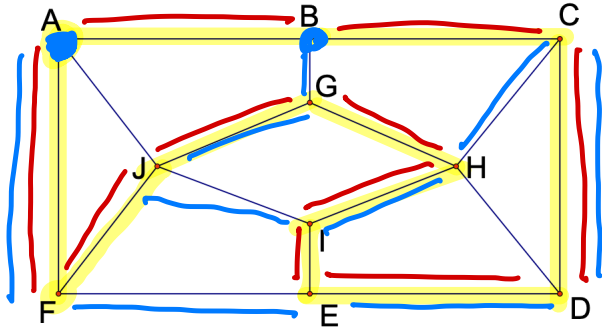
We can Eulerize it by adding edges.

SCBSABNCNAS

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

try on your own

Example 2. Consider the following graph.



1. Find two different Hamilton Circuits.

a) one HC that starts and end A.

A B C D E I H G J F A

- not used all edges

- B C D E I H G J F A B C

is considered the same circuit

mirror circuit A F J G H I E D C B A

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

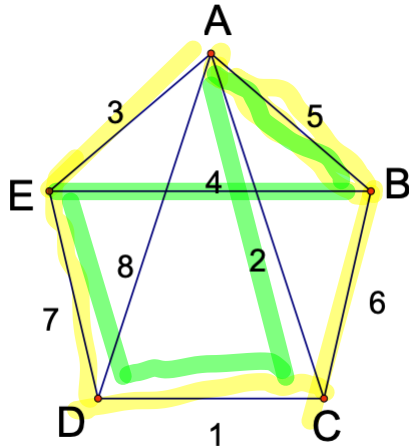
AFEDCHITGB

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

Try on your own

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

Example 3. Consider the following graph.



- a) What is the weight of AD? **8**
- b) What is the weight of the Hamilton Circuit ABCDEA?

$$5 + 6 + 1 + 7 + 3 = 22$$

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

$$2 + 1 + 6 + 4 + 5 = 19$$

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

$$N=3$$



K_3

edges = **3**

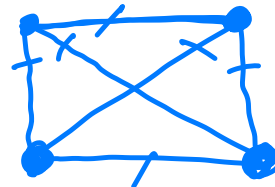
Factorial:

we use $!$ $\rightarrow$ denotes factorial

$$2! = 1 \cdot 2 = 2$$

$$3! = 1 \cdot 2 \cdot 3 = 6$$

$$4! = 1 \cdot 2 \cdot 3 \cdot 4 = 24$$



K_4

edges = **6**