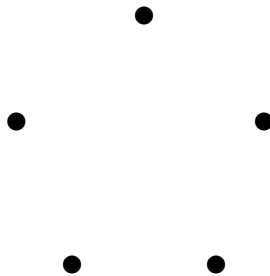


Midterm II
Math 116
Summer 2004
July 30, 2004

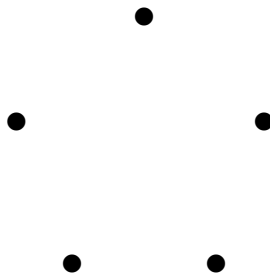
Show all your work. Correct answers without adequate supporting work will receive little or no credit.

1.) Give examples for the following graphs.

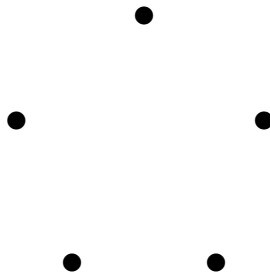
a.) Draw a graph with 5 vertices, each of degree 4 using no loops or multiple edges.



b.) Draw a graph with 5 vertices, each of degree 4 using both loops and multiple edges.



c.) Is it possible to draw a graph with 5 vertices each of degree 5? If so, give the graph. If not, explain why not.



2.)

a.) What does it mean to say a graph is connected?

b.) Draw a graph with at least 6 vertices and 6 edges, which is disconnected.

3.) For each of the graphs describe below, determine whether the graph has an Euler Circuit, Euler Path, or neither. **You need not justify your answers. However, one of the below is a trick question. Identify it.**

a.) Suppose the graph has 20 vertices, all even.
Euler Circuit? _____ Euler Path? _____

b.) Suppose the graph has 20 vertices, such that 18 are even and the remaining 2 are odd.
Euler Circuit? _____ Euler Path? _____

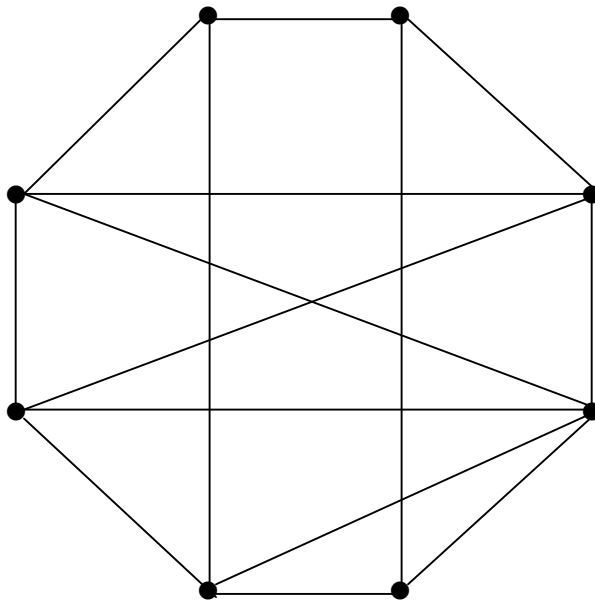
c.) Suppose the graph has 20 vertices, such that 10 are even and the other 10 are odd.
Euler Circuit? _____ Euler Path? _____

d.) Suppose the graph has 20 vertices, such that 15 are even and 5 are odd.
Euler Circuit? _____ Euler Path? _____

4.) This question is about the graph below.

a.) The graph below has no Euler Path. Why?

b.) Find an optimal Semi-Eulerization of the graph below.



c.) Find an Euler Path in your Semi-Eulerization of the graph above. (Label the edges in the order they are traveled.)

- 5.) President Bush's campaign team is planning a bus trip to five key swing states next week. The cities and their distances apart (in miles) are in the table below.

	Orlando	Little Rock	St. Paul	Phoenix	St. Louis	Washington D.C.
Orlando	*	962	1560	2142	994	852
Little Rock	962	*	860	1347	405	1014
St. Paul	1560	860	*	1797	612	1098
Phoenix	2142	1347	1797	*	1507	2336
St. Louis	994	405	612	1507	*	830
Washington D.C.	852	1014	1098	2336	830	*

- a.) In order to save time and money, they want to minimize the total distance of the trip. So, in what order should they visit the 5 cities, starting and ending their trip in Washington D.C.?

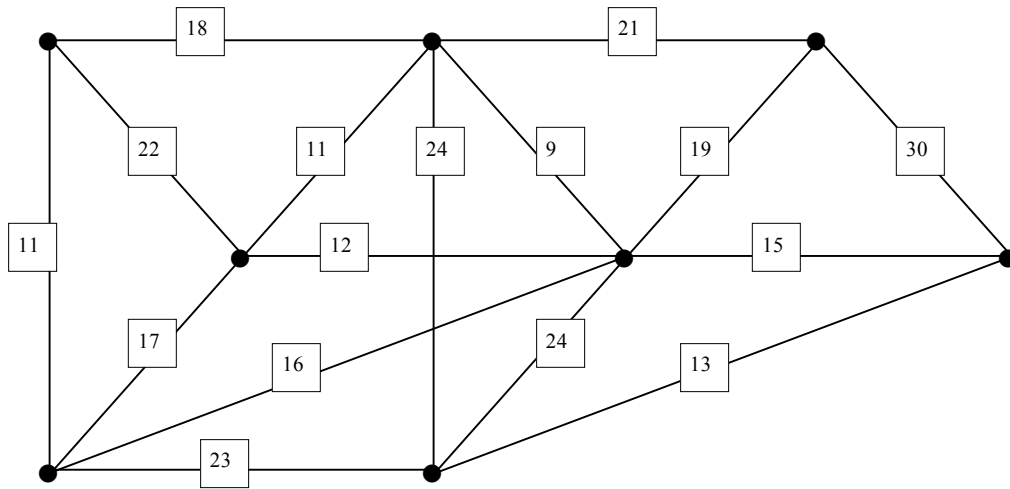
- b.) How did you get your answer? Be specific.

6.)

a.) What is a tree?

b.) Draw a graph with at least 6 vertices, which is a tree.

7.) Find a minimum spanning tree for the graph below, and give the total weight of your MST.



- 8.) Linkin Park is setting up their 2005 World Tour. They're going to take their private jet and perform in 100 cities around the world over the course of the year. Their manager has given you a table of all 100 cities, the distances between them, and a calculator. Which method would you use to find the shortest trip that starts and ends in their hometown of Santa Monica and hits each city exactly once? Explain why you think this method is the best.