Mathematical Concepts — Exam 4
MAT 117, Spring 2011 — D. Ivanšić

Name: _____

Show all your work!

1. (26pts) Murray's Lady Gaga fan club wishes to put up a poster that highlights her best feature. To decide what this is, they survey the members to rank her following prominent features: clothes, hair, or nose.

Votes:	3	5	1	4	6	1
1st	C	C	H	H	N	N
2nd	H	N	C	N	C	H
3rd	N	H	N	C	H	C

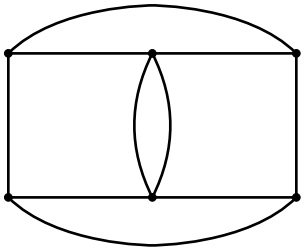
a) Which choice wins the vote in a plurality election?
b) Which choice wins the vote in a plurality election with a runoff?
c) Which choice is the pairwise comparison winner?
d) Which choice is the winner using Borda's method? Perform the check on the sum of Borda points.

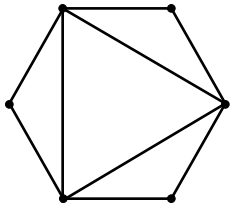
2. (28pts) A town is trying to decide which community project to fund next. The choices are a fountain, a museum, a pool, or sidewalks. The preference rankings of the townspeople broke down into the following percentages.

Votes	18	15	9	17	11	16	14
1st	F	M	M	P	P	S	S
2nd	M	S	P	M	F	P	F
3rd	S	F	S	F	S	M	M
4th	P	P	F	S	M	F	P

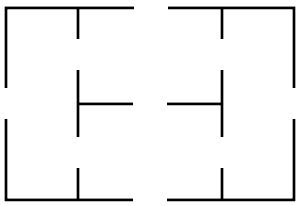
a) Which choice wins the vote in a plurality election?
b) Which choice wins the vote in a plurality election with elimination?
c) Which choice wins the vote in a plurality election with a runoff? (Is it the same as b?)
d) Which choice is the winner using Borda's method? Perform the check on the sum of Borda points.

3. (12pts) Determine whether each of the following graphs has an Euler path or an Euler circuit. If it does, find it, if not, explain why not.





4. (15pts) Below is a floor plan of a building, with doors joining rooms indicated.
a) Represent the floor plan as a graph (don't forget to include an "outside").
b) Use the graph to determine if it is it possible to walk around the building, passing through every door exactly once. If it is, draw the route.
c) Is it possible to do the same as in b), and start and finish outside?



5. (19pts) A weary tourist would like to visit Lexington, Louisville, Bowling Green and Paducah, while trying to minimize the distance traveled. The table below has the distances between the cities.
a) Draw a weighted graph that corresponds to this problem.
b) Use the brute force method to find the route that minimizes the distance traveled. First list all the possible orders of visits with Paducah the starting city.
c) Use the nearest neighbor algorithm to find an approximate solution to the problem. Is it the same as in c)?

	BG	Le	Lo
Le	154		
Lo	112	74	
P	151	262	220

Bonus. (10pts) Find an approximate solution to the traveling salesman problem. Show the weight of the found circuits. Use (one on each picture)
a) the nearest neighbor algorithm starting at A.
b) the greedy algorithm.