Math 105-21 Summer Term II
Test 4: 7/01/2016 Name: _____

To receive full credit for this 200 point Exam, you must show ALL work. Given the following preference schedule, answer the following questions.

Use the following for the next four problems. You are the member of a club with 39 members, and everybody in the club loves a good pizza. So you decided to choose a pizza place by having the members rank their favorite pizza places, with the following choices: Spinellis (S), Boombozz (B), Impellizzeris (I), and Wicks (W). The following preference schedule results:

Number of Voters:	10	13	7	9
First	S	B	W	I
Second	I	S	B	W
Third	B	W	I	S
Fourth	W	I	S	B

1. (*25 points*) What is the winner using the method of Pairwise Comparison? Does this voting method show a violation of Condorcet Fairness Criterion? Does this voting method show a violation of Majority Fairness Criterion? Explain your answer.

2. (*25 points*) Using the voting preference from above. Find the winner of the election using the Borda Count Method. Does this voting method show a violation of Condorcet Fairness Criterion? Does this voting method show a violation of Majority Criterion? Explain your answer.

For the following, consider the same situation, but Impellizini's (I) is no longer available for the meeting, so you take them out of the mix. The below preference profile is generated:

Number of Voters:	10	13	7	9
First	S	B	W	W
Second	B	S	B	S
Third	W	W	S	B

3. (*25 points*) Compare the voting preference above to that from page 1. Find the winner of the election using the Plurality. Does this voting method show a violation of Independence of Irrelevant Alternatives? Does this voting method show a violation of Majority Criterion? Explain your answer.

4. (*25 points*) Compare the voting preference above to that from page 1. Find the winner of each election using the Plurality with elimination. Does this voting method show a violation of Independence of Irrelevant Alternatives? Explain your answer.

5. (*20 points*) A town has three districts, A, B, and C, and a force of 35 police officers. The population of the three districts are shown below. Apportion the police officers using the Hamilton Method

District:	Population	Standard Quota	Lower Quota	Extra Seat?	Hamilton Apport.
A	9,900				
B	6,615				
C	4,485				

6. (*20 points*) A town has three districts, A, B, and C, and a force of 35 police officers. The population of the three districts are shown below. Apportion the police officers using the Hamilton Method

District:	Population	Standard Quota	Lower Quota	Extra Seat?	Hamilton Apport.
A	9,955				
B	6,915				
C	4,480				

7. (*10 points*) What paradox, if any, is demonstrated in the above 2 problems?

8. (*20 points*) A clinic has 225 nurses working four shifts. The number of nurses working each shift is to be apportioned using the Hamilton Method, according to the average number of patients in that shift. Apportion the nurses to the shifts using the Hamilton-Hill Method.

Shift:	Avg # of Patients	Standard Quota	Rounding Bound	Round Up/Down?	H-Hl Apport.
A	869				
B	1025				
C	619				
D	187				

9. (*20 points*) A clinic has 226 nurses working four shifts. The number of nurses working each shift is to be apportioned using the Hamilton Method, according to the average number of patients in that shift. Apportion the nurses to the shifts using the Huntington-Hill Method.

Shift:	Avg # of Patients	Standard Quota	Rounding Bound	Round Up/Down?	H-H Apport.
A	869				
B	1025				
C	619				
D	187				

10. (*10 points*) What paradox, if any, is demostrated in the above 2 problems?