Review 1 Name:_____
A&S100
20 September 2002

The following problems were selected from your textbook.

1. Suppose there are 140 votes cast in an election among five candidates — Stein, O'Rourke, Cohen, Holt, and Massey — to be decided by plurality. After the first 100 votes are counted, the tallies are as follows:

Stein	12
O'Rourke	23
Cohen	17
Holt	29
Massey	19

   (a) What is the minimal number of remaining votes Holt needs to be assured of a win?

   (b) What is the minimal number of remaining votes Cohen needs to be assured of a win?

2. A campus programming committee must decide what kind of act to book for its next engagement. The choices are a comedian, a jazz trio, a pianist, a rock band, and a classical guitarist. The committee members decide to make the decision through an approval election and the resulting ballots are as follows:

Number of Voters	1	3	2	1	1	1	2	1	1
Comedian	✓		✓				✓	✓	
Jazz trio			✓	✓	✓		✓		✓
Pianist				✓		✓			✓
Rock band					✓		✓	✓	✓
Classical guitarist		✓				✓		✓	✓

   Which act wins the vote?

3. The members of a community theater organization must vote to decide which play they would like to put on. The preference rankings of the members are as follows:

Number of Voters	2	1	4	1	1	3	1	2
The Fantasticks	1	1	2	3	4	2	3	4
Romeo and Juliet	3	4	1	1	1	4	2	3
Our Town	4	3	3	4	2	1	1	2
Death of a Salesman	2	2	4	2	3	3	4	1

   (a) Which play would win a plurality vote?

   (b) Which play would win a plurality vote with a runoff between the top two finishers?

   (c) Which play would win under Borda's Method?

   (d) Which play, if any, is the Condorcet winner?

   (e) Could the three voters who ranked Our Town first and The Fantasticks second achieve a preferable outcome in an election decided by Borda's method by voting strategically if the others voted as shown in the table?

   (f) Could the three voters who ranked Our Town first and The Fantasticks second achieve a preferable outcome in an election decided by the plurality method with a runoff between the top two by voting strategically if the others voted as shown in the table?

4. Explain why the plurality method with a runoff between the top two finishers satisfies the Pareto optimality property.

5. Construct an example of preference rankings for an election with four candidates — A, B, C, and D — so that, in two-person races, A would defeat B, B would defeat C, C would defeat D, and D would defeat A.

6. Partial results of Greenland's Inatsi-satut election of March 5, 1995 are shown in the table. Apportion 28 seats to the three political parties based on these results, using

   (a) Hamilton's method

   (b) Lowndes' method

   (c) Jefferson's method

   (d) Webster's method

Party	Siumut	Inuit Ataqatigiit	Atassut
Percentage of Votes	38.5	20.3	29.7

7. The 1997 enrollments of the junior high schools in the Chino Valley Unified School District in California are shown in the table. Suppose the district receives a grant to purchase 225 new computers for its five junior high schools. Apportion the computers to the schools based on their enrollments, using

   (a) Hamilton's method

   (b) Lowndes' method

   (c) Jefferson's method

   (d) Webster's method

   (e) Which apportionment is least favorable to the largest school, Canyon Hills?

   (f) Do any of these apportionments violate the Quota Property?

School	Canyon Hills	Magnolia	Ramona	Townsend	Woodcrest
Enrollment	1050	924	917	841	502

8. If the natural divisor works for Webster's method, explain why Webster's method and Hamilton's method give the same apportionment.

9. Explain why Jefferson's method will never give a state fewer seats than its natural quota rounded down.