The exam should take about 60 minutes on Thursday, but you'll have the whole 75 minutes. It is worth a fair amount of the final grade (average of best 3 out of 4 exams is 45% of final grade).

The questions should be similar to what we do in class on the worksheets, so look at past worksheets.

The voting methods I'll use on the questions:

- plurality, [1st place votes give 1 point; most points wins]
- Daisia's rule, [1st and 2nd place votes give 1 point; most points wins]
- Thomas's rule = Borda count, [last place gives 1 point; 2nd to last gives 2 points; n'th to last gives n points; most points wins]
- plurality with elimination [least first place votes is eliminated; repeat until 1 candidate left]
- pairwise comparison [do all the head to heads; each win is 1 point; each tie is 1/2 point; most points wins]

You can use Soccer rule and Bracket method in your essay answers. If you use a method not mentioned here, you should explain it.

The fairness criteria I'll use on the questions:

- Anonymous [voters are treated equally]
- Neutral [restaurants are treated equally]
- Monotone [votes are good for resteraunts: If Ovid's wins at first, but then Amari changes their ballot to move Ovid's closer to their first place vote, then Ovid's still wins.]
- Majority criterion [if a restaurant has the majority of first place votes, then it should win]
- Condorcet criterion [if a restaurant is a condorcet winner, then it should win]
- IIA [if you remove a losing restaurant, then the winner doesn't change; in reverse: if you add a new restaurant, either it wins because it is better than the old winner, or the old winner still wins because it is better than the new restaurant]

So in each of the questions on this practice exam, consider how the question would change if I replaced the voting method or the fairness criterion.

The exam will be four pages. Each page is worth 25%. Most letters (a,b,c,d,e) on a particular page are worth the same amount, 5 points.

1. (a) Convert this set of ballots into a preference schedule.

(b) How many voters are needed to form a majority in this election.

(c) If you eliminate this candidate, what does the new preference schedule look like?

(d) In this head-to-head matchup, how many votes does each restaurant get?

(e) Name one restaurant that is NOT a Condorcet winner.

2. Here is a preference schedule.

(a) Show work: Who wins using plurality

(b) Show work: Who wins using plurality with elimination

(c) Show work: Who wins using pairwise comparison

(d) Show work: Who wins using Thomas's rule = Borda count

(e) Show work: Who wins using Daisia's rule

3. (a) What is the name of the fairness criterion that says "everyone's vote should count equally"?

(b) What is the name of the fairness criterion that says "if a restaurant has more than half of the first place votes, then it should have been chosen as the winner"?

(c) Describe a simple voting method that is not anonymous.

(d) Here is a preference schedule or two and who wins for each under Jack's Super Rule. Explain why you know that Jack's SR fails the Majority criterion [or some other criterion on the real exam]

(e) The APCFBC method (a priori condorcet fair borda count) chooses a winner as follows: if there is a condorcet winner, then they win, otherwise use Borda count as normal. Explain why this method satisfies the majority criterion. Be sure to state the majority criterion in your answer.

4. (a) [10 points] Construct an example of a preference schedule where plurality disagrees with one of the other methods [name the other method, say who won both methods, and explain "how" you figured out your example].

(b) [10 points] Pick one of neutral, condorcet criterion, or IIA, and explain what it demands of a voting method and why any method that doesn't satisfy it is totally unfair.

(c) [5 points] Why does a restaurant with more than half of the first place votes always win a plurality election?