

Topics in Computational Social Choice 2026:

Exercise Sheet #1

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Instructions. Write at most one page of text and then email your solutions as a PDF to both instructors no later than **19:00 on Tuesday, 6 January 2026**. You are free to discuss this assignment with others and to make use of additional resources in any way that seems reasonable. Always include a short paragraph in which you document what outside help you received and what sources of information you consulted (if any).

The intended workload for this exercise sheet (including readings) is two full working days.

Read Chapter 1 of the *Handbook of Computational Social Choice*, excluding Section 1.5 (on basic concepts in TCS). For the proof of Arrow's Theorem, you can skip over some of the details, but try to understand at least the general approach taken. We will discuss a proof of (a slightly different variant of) this theorem later on in class as well.

Exercise 1. Briefly comment on a fact mentioned in the chapter that you find interesting or surprising, and that you were unaware of before.

Exercise 2. Briefly comment on a research topic mentioned in the chapter that you would want to learn more about.

Exercise 3. The specific variant of Arrow's Theorem stated in the book talks about social welfare functions (SWFs) that map any profile of linear preference orders into a single weak preference order. The theorem says that, for three or more alternatives, any such SWF that satisfies IIA and the weak Pareto condition must be dictatorial. Answer the following questions, giving a one-sentence justification for your answer in each case:

- (1) Does the theorem continue to hold if we model individual preferences as weak orders rather than as linear orders?
- (2) The theorem is not claimed to hold for the case of two alternatives. Give a counterexample for the case of two alternatives and 17 voters.
- (3) The theorem does not explicitly state any constraints on n , the number of voters. Does it hold for $n = 1$?
- (4) How many different dictatorships are there?
- (5) We say that a SWF satisfies the axiom of *anonymity* if switching the order of the voters never changes the output (so if all voters are treated the same). How many SWFs satisfy all of anonymity, IIA, and the weak Pareto condition?

Exercise 4. In the second week of the project you will present a recent paper on a specific topic in computational social choice. The papers to choose from are listed on the project website. Skim through those papers, to get a first idea of what they are about, and for three of them you would be interested in presenting yourself, briefly explain why.