

Arrow's theorem says that certain axioms lead to a "dictatorship". The following two exercises examine axioms around "majority voting".

Ex. 1

Read the quite short paper by Kenneth O. May, "A SET OF INDEPENDENT NECESSARY AND SUFFICIENT CONDITIONS FOR SIMPLE MAJORITY DECISION". (*Econometrica*, 1952, Vol. 20, Issue 4, pp. 680–684. Available on jstor, using your tugraz account).

May's main result is: A group decision function is the method of simple majority decision if and only if it is always decisive, egalitarian, neutral, and positively responsive, (with precise definitions of these terms).

Ex. 2

Read the paper "A simple proof of Sen's possibility theorem on majority decisions" and follow the proof of Sen's theorem.

Ex. 3

Let $f(k)$ denote the number of distinct strings of length k that occur (somewhere) in the Thue-Morse sequence. Determine (e.g. by computer) $f(k)$, $k = 1, 2, 3, \dots$, as far you can go. Guess the growth rate of $f(k)$.

Search for "Thue-Morse, subword complexity", also in the database (mathscinet). Which results are known for $f(k)$ and can you prove any?

Ex. 4

Prove that every Thue-Morse descendant has property M ,

Ex. 5

Prove that every descendant of the Thue Morse sequence is almost periodic.

Hand in solutions this coming Monday on problems 3-5. For problems 1-2 your reading should include that you can explain it on the board.