

Algorithmic Game Theory

Summer Term 2024

Tutorial Session - Week 10

*You are supposed to work on these tasks in class together with your fellow students.
Please find groups of 2 or 3 students!*

Exercise 1:

Consider an instance of cake cutting with 3 agents and $v_1(x) = 2x$, $v_2(x) = 1$, $v_3(x) = 0$ for $x \in [0, \frac{2}{3})$ and $v_3(x) = 3$ for $x \in [\frac{2}{3}, 1]$.

Find a proportional allocation using the algorithm in section 4.

Exercise 2:

The cake cutting protocol *cut and choose* for two agents can also be considered as a direct mechanism: Both agents simultaneously report a valuation density function $b_i: [0, 1] \rightarrow \mathbb{R}_{\geq 0}$ for $i = 1, 2$. Afterwards, the mechanism cuts the point t such that $\int_0^t b_1(x)dx = \int_t^1 b_1(x)dx = \frac{1}{2}$. Then it allocates that piece of $[0, t)$ and $[t, 1]$ to agent 2 that maximizes her declared value leaving the other piece for agent 1.

Prove that the given mechanism is not DSIC.