

Algorithmic Game Theory

Summer Term 2024

Tutorial Session - Week 5

*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 a second-price auction with a fixed value profile $(v_i)_{i \in N}$. Since the value profile is fixed, we get a normal-form utility-maximization game.

- (a) Show that there exists a pure Nash equilibrium in the defined game.
- (b) Now, consider a game in which only two players participate and $v_1 \gg v_2$ holds. Prove that even in this setting there exists a pure Nash equilibrium such that bidder 2 wins.

Exercise 2:

Recall the auction of k identical items from the previous exercise sets: Each bidder can acquire at most one of the items. If bidder i gets one of the items, she has a value of v_i . Otherwise, that is, if she does not get an item, she has a value of 0.

Make use of the VCG-results from the lecture in order to design a truthful mechanism for this auction. For this purpose, explicitly state the function f and calculate the payment rule p .