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Algorithmic Game Theory

Summer Term 2024

Tutorial Session - Week 4

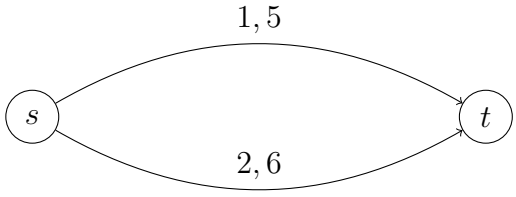
You are supposed to work on these tasks in class together with your fellow students. Please find groups of 2 or 3 students!

Exercise 1:
Analogous to the auctions that we defined in the lecture, we will consider the following *Third-Price Auction*. Just like in the first- and second-price auctions, bidders simultaneously submit their bids $b_i \geq 0$ and the winner will be determined as the bidder with the highest bid. Finally, the mechanism will make him/her pay the third highest bid. Prove that the described mechanism is not truthful.

Exercise 2:
Referring to the price of anarchy from Lecture 8 we can introduce a more optimistic point of view called the *price of stability*. For an equilibrium concept Eq, it is defined as

$$PoS_{\mathsf{Eq}} = \frac{\min_{p \in \mathsf{Eq}} SC(p)}{\min_{s \in S} SC(s)} \ .$$

Consider the following symmetric network congestion game with two players:



(a) What is the Price of Anarchy and the Price of Stability of pure Nash equilibria?

(b) What is the Price of Anarchy and the Price of Stability of mixed Nash equilibria?