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## Exercises for Algorithmic Game Theory

<http://www.mpi-inf.mpg.de/departments/d1/teaching/ss11/AGT/>

Assignment 4

Deadline: Fr. 13.5.2011

### Exercise 1 *Sealed-price Vickrey auction*

In a sealed-price auction, bidders are unaware of each other's bids; they seal their bids and submit them to the auctioneer.

- How can a **group** of bidders lie in this auction and benefit from it?
- How can the auctioneer lie in this auction and benefit from it?

### Exercise 2 *Dutch auction*

A Dutch auction is an open-cry descending auction, where the auctioneer calls out bids starting from a high value and going down. The first bidder to say "Mine" gets the item and has to pay the last-called bid. Explain that there is no dominant strategy in this auction (what would you do in such an auction?).

### Exercise 3 *Clarke's pivot rule*

Show that a second-price auction is a VCG-mechanism with Clarke's pivot rule.

**Remark:** We showed already in class that it is a VCG-mechanism.

### Exercise 4 *Bilateral Trade*

In this problem a seller holds an item and values it at some value  $w_s$  and a buyer wants the item and values it at some value  $w_b$ . Let  $A = \{\text{"trade"}, \text{"no-trade"}\}$  and define

$$v_s(\text{trade}) = -w_s$$

$$v_b(\text{trade}) = w_b$$

$$v_s(\text{no-trade}) = v_b(\text{no-trade}) = 0.$$

Let  $(f, p_s, p_b)$  be a VCG-mechanism.

- What are the conditions for outcome "trade"?
- Define the functions  $h_s$  and  $h_b$  such that  $p_b = p_s = 0$  in the case of no-trade. What are  $p_b$  and  $p_s$  in the case of trade?