

CS364B: Problem Set #2

Due in class on Monday, October 15, 2007.

Instructions:

Collaboration on this homework is actively encouraged. However, your write-up must be your own, and you must list the names of your collaborators on the front page.

Keep an eye on the course web site for a FAQ on this homework.

Problem 1

Finish the remaining problem from HW #1.

Problem 2

Exhibit a set of valuations and GSP equilibria with the following properties.

- (a) A GSP equilibrium that does not induce envy-free prices.
- (b) A GSP equilibrium that is not an economically efficient allocation of the slots.
- (c) A GSP equilibrium with less revenue than the VCG outcome. How big a gap between the VCG revenue and the worst-case GSP equilibrium revenue can you show?

Problem 3

Let v be a set of valuations with $v_1 > \dots > v_n$ and consider n slots with $\alpha_1 > \dots > \alpha_n$. Suppose a set b of bids is a GSP equilibrium, and in addition that

$$(v_i - b_{i+1})\alpha_i \geq (v_i - b_i)\alpha_{i-1}$$

for every bidder $i > 1$ (interpret b_{n+1} as 0). (Bid b_1 doesn't matter as long as it is greater than b_2 .) Prove that this equilibrium is envy-free (i.e., the induced prices are envy-free for the valuations v).

Problem 4 (Extra Credit)

Exercise 28.4 from the Lahaie/Pennock/Saberi/Vohra book chapter.