

Take home exam - Algorithmic Game Theory
July 5, 2013

Please hand in by August 1, 2013. You may use any background material that you find, as well as discuss the topics of the exam with others, but please write your answers on your own.

1. Write an overview on linear programming and its uses in algorithmic game theory. This overview needs to provide clear (and correct) definitions explaining what a linear program is, and explanation of useful concepts associated with linear programming, such as *basic feasible solutions*, *duality*, *complementary slackness conditions*. As to applications in game theory, define the following notions.
 - (a) The minimax theorem.
 - (b) Correlated equilibrium.
 - (c) The configuration LP for welfare maximization in combinatorial auctions.
 - (d) Walrasian equilibrium
 - (e) The Bondareva-Shapley theorem.

For each of them, explain the relevance of linear programming and of the concepts associated with linear programming.

2. Discuss the competition project given earlier in the course. Your discussion should include several aspects.
 - (a) The game-theoretic background. Specifically, which concepts learned in the course are potentially relevant to the project?
 - (b) The practical aspect from your own subjective point of view. Is there anything about the theoretical concepts that influenced your choice of strategy? If yes, what did you find useful? If your strategy was based on principles other than those discussed in the course, what are they?
 - (c) If your strategy was based on principles not discussed in the course, can you propose a theoretical model that captures these principles?