Algorithmic Game Theory - handout4

Uriel Feige

18 April 2013

Homework.
Please keep the answers to the following questions short and easy to read.

1. Prove that for every finite two-player zero-sum game, in every Nash equilibrium every player is playing a max-min (mixed) strategy.

2. Let us call a pure strategy s in a two player game *inferior* if for every mixed strategy t of the other player, strategy s is not a best response with respect to t. Clearly, an inferior strategy cannot be part of a Nash equilibrium. Show that there is a polynomial time algorithm for detecting whether a two player game (given in standard form) has an inferior strategy. (Hence such strategy can be removed prior to attempting to find a Nash equilibrium.)

3. Show that there is a universal constant c (say, $c = 4$) such that in every two person game with payoffs between 0 and 1, every ϵ-Nash can be changed into a $c\sqrt{\epsilon}$-well supported Nash that is supported only on strategies that appear in the support of the given ϵ-Nash.