Algorithmic Game Theory - handout4

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The fourth Israeli Seminar on Computational Game Theory will be held on Wednesday, December 31, 10:00AM – 4:30PM in Microsoft Israel R&D Center, 13 Shenkar St. Herzliya. To register, send an email to ac-ildc@microsoft.com with your name and affiliation, with a subject: ISRAELI AGT SEMINAR. For details see the seminar's web page:

`http://pluto.huji.ac.il/~mfeldman/cgt4_2008.html`

We are considering cancelling class on that day.

Homework.

Reading: More information on the computation of of Nash equilibria can be found in chapters 2 and 3 of [NRTV].

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. A pure strategy s in a two player game is said to be *dominated* if for every mixed strategy t of the other player, strategy s is not a best response with respect to t. Clearly, a dominated 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 a dominated 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.

References

[NRTV] Noam Nisan, Tim Roughgarden, Eva Tardos and Vijay V. Vazirani (Editors), Algorithmic Game Theory, Cambridge University Press, 2007.