

Algorithmic Game Theory

Summer Term 2023

Exercise Set 2

If you want to hand in your solutions for this problem set, please send them via email to anna.heuser@uni-bonn.de by Tuesday evening – make sure to send a pdf-file which contains your name and your email address. Of course, submitting solutions in groups is also possible.

*If you would like to present one of the solutions in class, please also send an email to anna.heuser@uni-bonn.de containing the **task** which you would like to present and in **which of the tutorials** you would like to do so. Deadline for the email is Tuesday, 10:00 pm. Please note that the tasks will be allocated via a first-come-first-served procedure, so sending this email earlier than Tuesday evening is highly recommended.*

Exercise 1: (3+2 Points)

Consider the bimatrix game *Battle of the Sexes* given in Example 3.3 of the third lecture.

- a) Compute a mixed Nash equilibrium by choosing probabilities for one player that will make the other player indifferent between his pure strategies (see Example 3.11).
- b) Determine the probabilities of the mixed Nash equilibrium graphically by plotting the players' expected costs.

Exercise 2: (4 Points)

We define a strategy $s_i \in S_i$ of a normal-form cost-minimization game to be *strictly dominated*, if there exists a strategy s'_i such that $c_i(s'_i, s_{-i}) < c_i(s_i, s_{-i})$ for all $s_{-i} \in S_{-i}$. Prove that for all mixed Nash equilibria σ , there is no player $i \in \mathcal{N}$ with a mixed strategy σ_i such that $\sigma_{i,s_i} > 0$ for a strictly dominated strategy $s_i \in S_i$.