## Introduction to Game Theory

B. Nebel, R. Mattmüller                    University of Freiburg
T. Schulte, D. Speck                  Department of Computer Science
Summer semester 2015

# Exercise Sheet 7
### Due: Friday, June 19th, 2015

**Exercise 7.1** (Induced Strategic Game, 2 + 2 points)

Consider the two player extensive form game defined by the following game tree.
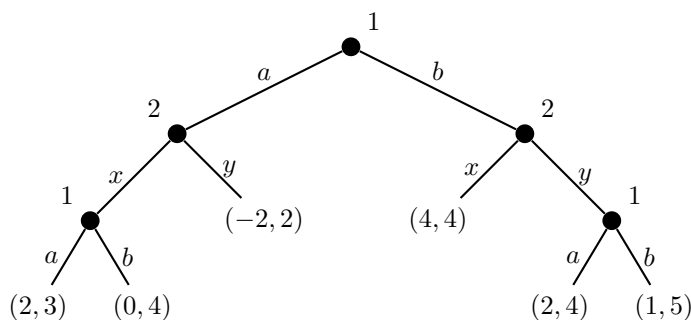


(a) Specify the induced strategic game.
(b) Determine all Nash equilibria and identify all non-credible threats.

**Exercise 7.2** (Extensive Games, 2 + 1 + 1 points)

The owner of a retail chain $R$ operates stores in $K$ cities. In each city $k$, $1 \leq k \leq K$, there is a potential competitor $C_k$ who can decide to open up a store ($O_k$) or to stay out of business ($\neg O_k$). If competitor $C_k$ opens a store, $R$ can either start a price war ($P_k$) or ignore the competitor ($\neg P_k$). The competitors make their decisions sequentially, i.e. when $C_k$ makes its decision, $C_1, \ldots, C_{k-1}$ have already made their decisions and $C_k$ is aware of their choice and the reactions of $R$. In every city $k$ competitor $C_k$ gets payoff 0 if he chooses to stay out of business, payoff 2 if he opens a store and $R$ is not starting a price war, and payoff $-2$ if he opens a store and $R$ starts a price war. The retail chain owner $R$ gets a payoff of $3K$ if no competitor opens a store. For every competitor opening a store $R$'s payoff is reduced by 2. For every price war $R$ decides to start the payoff is additionally reduced by 1. Regard the special case of $K = 2$.

(a) Model this situation as an extensive game with perfect information and specify the game tree.
(b) Specify the set of $C_2$'s strategies.
(c) Determine a subgame perfect equilibrium and a Nash equilibrium that is not a subgame perfect equilibrium.

The exercise sheets may and should be worked on, and handed in, in groups of two students. Please indicate both names on your solution.