

CSC 5350 Assignment 1

Due date: 6 October 2008

1. **(Exercise 24.1)** Let G be a strictly competitive game that has a Nash equilibrium.
 - a. Show that if some of player 1's payoffs in G are increased in such a way that the resulting G' is strictly competitive then G' has no equilibrium in which player 1 is worse off than she was in an equilibrium of G . (Note that G' may have no equilibrium at all.)
 - b. Show that the game that results if player 1 is prohibited from using one of her actions in G does not have an equilibrium in which player 1's payoff is higher than it is in an equilibrium of G .
 - c. Give examples to show that neither of the above properties necessarily holds for a game that is not strictly competitive.
2. **(Exercise 35.1)** Each of n people announces a number in the set $\{1, \dots, K\}$. A prize of \$1 is split equally between all the people whose number is closest to $2/3$ of the average number. Show that the game has a unique mixed strategy Nash equilibrium, in which each player's strategy is pure.
3. **(Exercise 94.2)** Let G be a two-player strategic game $\langle \{1,2\}, (A_i), (\succeq_i) \rangle$ in which each player has two actions: $A_i = \{a'_i, a''_i\}$ for $i=1,2$. Show that G is the strategic form of an extensive game with perfect information if and only if either for some $a_1 \in A_1$ we have $(a_1, a'_2) \sim_i (a_1, a''_2)$ for $i=1,2$ or for some $a_2 \in A_2$ we have $(a'_1, a_2) \sim_i (a''_1, a_2)$ for $i=1,2$.

— End of Assignment —