**14.12 Game Theory**
Muhamet Yildiz
**Fall 2012**

# Homework 3

Due on 10/26/2012 (in recitation)

1. [Recall Problem 4 in Homework 2.] Compute the subgame-perfect Nash equilibria in the following game. A unit mass of kids are uniformly located on a street, denoted by the $[0,1]$ interval. There are two ice cream parlors, namely 1 and 2. First, each ice cream parlor $i$ selects location $x_i \in [0,1]$, simultaneously. Then, observing $(x_1, x_2)$, each ice cream parlor $i$ sets a price $p_i \geq 0$ for its own ice cream, simultaneously. A kid located in $w$ is to pay cost $c(w-y)^2$ to go to a store located at $y$, where $c > 0$. Given the locations $x_1$ and $x_2$ and prices $p_1$ and $p_2$, each kid buys one unit of ice cream from the store with the lowest total cost, which is the sum of the price and the cost to go to the store. (If the total cost is the same, she flips a coin to choose the store to buy.)

2. Exercise 1 in Lecture Notes Section 11.5.

3. Exercise 10 in Lecture Notes Section 11.5.

4. Exercise 11 in Lecture Notes Section 11.5. Assume that $n = 3$, $p_1 = p_2 = p_3$, and $\delta$ is sufficiently large.

   Hint: Consider a strategy profile where the play depends on the "state." There are $m$ states $k = 1, \ldots, m$. The game starts at some state $k_0$. For each state $k$, there is a division $x_k = (x_{k,1}, \ldots, x_{k,3})$. At state $k$, the proposer is to offer $x_k$ and $x_k$ is to be accepted by all players. If an offer $y$ by proposer $i$ is rejected by $j$, in the next round we proceed to a state $K(k,i,y,j)$. You should find $m$, divisions $x_1, \ldots, x_m$ and a function $K$, and determine which offers are rejected by which players at a given state. Verify that any offer $y \neq x_k$ is indeed rejected by some player at state $k$, and verify that the strategy profile you found is indeed a SPE using single deviation principle.

MIT OpenCourseWare
http://ocw.mit.edu

14.12 Economic Applications of Game Theory
Fall 2012

For information about citing these materials or our Terms of Use, visit: http://ocw.mit.edu/terms.