Intermediate Microeconomics
Fall 2009

Problem Set 4

1. Smith and Jones are playing a number-matching game. Each chooses either 1,2, or 3. If the numbers match, Jones pays Smith $3. If they differ, Smith pays Jones $1.
   a) Describe the payoff matrix for this game.
   b) Find the pure strategy and mixed strategy Nash equilibrium.
   c) Calculate the expected payoff of both players.

2. Two firms (A and B) are considering bringing out competing brands of a healthy cigarette. Payoffs to the companies are shown in the table:

		B	
		Produce	Not Produce
A	Produce	3,3	5,4
	Not Produce	4,5	2,2

   a) Does this game have a Nash Equilibrium?
   b) Does this game present any first-mover advantages for either firm A or firm B?
   c) Would firm B find it in its interest to bribe firm A enough to say out of the market?

3. A monopolist can produce at a constant average and marginal cost AC = MC = $5. It faces a market demand curve given by Q = 50 – P.
   a) Calculate the profit-maximizing price and quantity for this monopolist. Also calculate his profit.
   b) Suppose a second firm with the same production technology enters the market and they two determine the output level simultaneously. What is the equilibrium price and quantity of each firm? Also calculate the profit for each firm.
   c) Suppose there are N firms with the identical technology above. Calculate the equilibrium price, quantity and profit for each firm.
   d) Return to the two firms case. Now suppose the first firm is the Stackelberg leader. Find the equilibrium quantity, price and profit for each firm.
   e) Suppose there are three firms. Firm 1 is the Stackelberg leader who decides quantity first, firm 2 and firm 3 decides quantity simultaneously after the decision of firm 1. Find out the equilibrium quantity, price and profit for each firm.

4. Suppose firms A and B each operate under conditions of constant average and marginal cost, but that $MC_A = 10$, $MC_B = 8$. The demand for the firms' output is given by

$$Q_D = 500 - 20P$$

   a) If the firms practice Bertrand competition, what will be the market price under a Nash Equilibrium?
   b) What will the profits be for each firm?
   c) Will this equilibrium be Pareto efficient?
   d) What if $MC_A = 15$?

5. Two firms compete by choosing price. Their demand functions are

$$Q_1 = 20 - P_1 + P_2; \quad Q_2 = 20 - P_2 + P_1$$

where P_1 and P_2 are the prices charged by each firm, respectively, and Q_1 and Q_2 are the resulting demands. Marginal costs are zero.

1) Suppose the two firms set their prices at the *same time*. Find the resulting Nash equilibrium prices.
2) Suppose Firm 1 sets its price *first*, and then Firm 2 sets its price. What price will each firm charge, how much will it sell, and what will its profit be? Does the first mover have a first-mover advantage?

6. 考虑下面一个两人静态博弈的报酬矩阵(payoff matrix)：

		参与人 2		
		X	Y	Z
参与人 1	A	18, 4	8, 12	15, 10
	B	4, 6	6, 7	14, 8
	C	6, 8	4, 2	6, 11

a) 找出上述博弈的纳什均衡，并简要说明理由。

b) 假定上述静态博弈采取序贯的方式 (sequential) 进行：参与人 1 首先选择其策略(选择之后就不可更改)，然后参与人 2 在观察到参与人 1 的策略之后再进行选择。这个博弈的均衡策略会是怎样的？简要说明理由。

c) 现在假定博弈是这样进行的：参与人 1 首先选择其策略，然后参与人 2 在观察到参与人 1 的策略之后再进行选择。但是，在参与人 2 做出选择之后，参与人 1 又可以自由改变其策略。此时博弈的均衡又是什么？为什么？简要说明理由。