Homework 5

due 3/29/2011

Problem 1 Suppose market demand is given by $p(q) = a - bq$, and there are two firms, each with a constant marginal costs of c and no fixed cost. The two firms choose quantity simultaneously, and then sell whatever they have produced at the prevailing market price.

a. Determine NE quantities for both firms. Demonstrate that there is only one equilibrium in this game.

b. Derive the market price, and the profit for each firm. Show that the total quantity produced is greater than the monopoly quantity, but less than the competitive quantity.

c. How high would δ need to be for there to be a SPE of the repeated game in which firm 1 receives fraction α of the monopoly profit and firm 2 receives fraction $1 - \alpha$? Make sure to say how your answer depends on α, including pointing out for what ranges of α no such equilibrium is possible.

d. Now suppose the game is played only once, but in which firm 1 moves first. Firm 2 moves only after observing the quantity firm 1 chooses. Derive the SPE of this game.

e. Finally, suppose there are J firms serving the market. In the static case, determine NE quantities and profits for each of the J firms. Show that as $J \to \infty$, total production approaches the competitive level, while when $J = 1$, we get the monopoly outcome.

Problem 2 The Phoenix Moons, a pro football team, have a stadium which seats 30,000 people. All seats are identical. The optimal ticket price is \$30, yet this results in an average attendance of only 20,000 people.

a. Explain how it can be profitable to leave 10,000 seats empty.

b. Next week the Moons play the Tucson Turkeys, who have offered to buy an unlimited number of tickets at \$4 each, to be resold only in Tucson. How many tickets should be sold to Tucson to maximize profits — 10,000? More than 10,000? Fewer than 10,000?

c. Given your answer to b., what price should the Moons charge their own fans? \$4? \$5? More than \$5?

Problem 3 An inventor has discovered a new method of producing a precious stone, using spring water found only in Venice, Italy and Danville, Kentucky. The process is patented and manufacturing plants are set up in both places. The product is sold only in Europe and the US. Trade laws are such that the price must be uniform within Europe and the US, but the European and American prices may differ. Transport costs are negligible, and there is no second-hand market in the stones because of the risk of forgeries. From the production and marketing data given below, determine the profit-maximizing production and sales plans. In particular, determine the output in Venice and Danville, sales in the US and Europe, quantity shipped from Europe to the US or vice versa, and prices in Europe and the US.

$$\text{Demand: US, } p = 1500 - \tfrac{1}{2}Q\text{; Europe, } p = 1000 - Q$$
$$\text{Average cost: Danville, } AC = 150 + .375Q\text{; Venice, } AC = 100 + \tfrac{1}{2}Q$$

Problem 4 MWG, problem 12.C.15

Problem 5 MWG, problem 12.C.16