ECON 6500, Summer 2008

British Columbia Institute of Technology

Assignment 4

Due July 24^{th} in the beginning of the class.

TRUE/FALSE/UNCERTAIN (5 points each) Evaluate whether the following statements are true, false, or uncertain and explain why. All points are given for your explanation.

1 If prisoners' dilemma game is played sequentially, the players will be able to reach an efficient outcome in the equilibrium.

2 Suppose you are a player in a game that has only one Nash equilibrium. Regardless of what the other players choose to do, you should play your equilibrium strategy because it is a best response to the other players' strategies.

Problem 1. (10 marks) Do question 10 on pp.511 of Part 3 of handouts for week 11. For full marks draw the normal form of the game and shortly explain how you use firms' best responses to find the equilibrium outcome of the game.

Problem 2. (10 marks) Consider the lab problem we did in class of July 3^{rd}. There are two firms in the market with $TC_A = 19q_A$ and $TC_B = \frac{q_B^2}{2}$. Market demand is $P = 100 - .5Q$, where Q is total quantity sold in the market $Q = q_1 + q_2$. Suppose that the firms play an infinitely repeated collusion game: they decide to maintain the collusion output unless one of them cheats. Under the collusion agreement firm A gets 60% of the joint profits, firm B gets 40%. If one firm cheats, cooperation ends and firms will play Cournot duopoly game forever. Find the range of interest rates for which collusion is sustainable (no firm has incentive to cheat on the agreement). You can use the results from the lab for the solution[1]. Will collusion work if the game has finite number of periods after which the whole market collapses and firms never see each other again? Explain carefully.
Hints: You have to consider each firm's incentive to cheat. Each firm uses the following logic. If a firm decides to cheat, to max profits it will produce its 'best response output' to the output the other firm produces under the collusion. Of course this will allow the cheating firm to collect higher profits in the year it decides to cheat, but as a punishment in all consecutive years it will only get its Cournot profits, which is lower than the profits it gets under the collusion. When making the decision to cheat the firm has to weight present value of profits in case it cheats against the present value of upholding the collusion agreement: for some range of interest rates cheating will be more profitable, for some interest rates collusion will be more profitable. Find the range of the interest rates such that no firm has incentive to cheat.

[1] If you missed the lab please make sure you can find the firm's best responses if they play Cournot duopoly game, find each firm's output, market price and each firm's profits in Cournot game. If the firms decide to collude they will maximize the joint profits they can earn in the market. This means that they will act as a monopolist that operates two plants with costs given by the total costs above.

Problem 4. (10 points) There are two firms operating in the market, total costs are $TC_1 = 10q_1$, $TC_2 = q_2^2$. Inverse market demand is given by $P = 350 - 2Q$, where $Q = q_1 + q_2$.

a) Find market price and output produced by each firm if firm 1 is the price leader.

b) What will be the market price and output of each firm if firms play Bertrand model of duopoly? Do you think that the market outcome is efficient in this case?