NOVA SCHOOL OF BUSINESS & ECONOMICS

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Time: 2:00

INDUSTRIAL ORGANIZATION
(B.S. in Economics and B.S. in Management)

Final exam (regular season)

Answer each question on a separate sheet of paper. Good luck!

1. [15 minutes; 4 points] The following statement was recently made by a former student of this course:

> "Take a duopoly with symmetric firms. Regardless of whether firms compete *à la* Cournot or *à la* Bertrand, the Herfindahl-Hirschman Index equals 0.5."

Comment in no more than ten lines (graphs, if any, excluded) while agreeing or disagreeing.

2. [15 minutes; 4 points] Jane Theory, the best student in her class, said:

> "When firms do not discount future profits (i.e., the discount factor equals 1), prices necessarily will be way above marginal costs due to tacit collusion."

Comment in no more than ten lines (graphs, if any, excluded) while agreeing or disagreeing.

3. [45 minutes; 6 points] Two brand new shoe repair shops have opened in a town. One, denoted N, is located in the North part of town, and the other, denoted S, is located in the South part. Both parts of town have the same number of consumers. The *weekly* demand for shoe repairs *in the whole town* is given by $q = 10 - p$. Each repair entails a constant marginal and average cost of 2, regardless of the shop that undertakes it. All consumers regard both shops as equally good at repairing shoes. Shops quote prices at the beginning of every week, doing so simultaneously and independently.

The shops' managers hold different views regarding consumers' search behavior. Firm N thinks that *all* consumers are active shoppers, i.e., they check the price charged by either shop before ordering a repair and choose the least expensive one. On the other hand, firm S believes that *none* is, i.e., each consumer will simply go the store located on its part of town. Their viewpoints are common knowledge, i.e., each firm is aware of their divergent assessment of consumers' behavior, knows that the other is also aware of it, and so on.

(i) What price will S quote during the first week of operation? Quantify and explain.

(ii) What price will N quote during the first week of operation? Quantify and explain. (Note: using the proverbial ε when answering this question may help you, and make the reasoning clear to the grader.)

(iii) Will both firms learn about consumers' search behavior by the end of the first week? If so, how do they learn it? Quantify while explaining.

(iv) What price will S quote after the first week? Quantify and explain.

(v) What price will N quote after the first week? Quantify and explain.

4. [45 minutes; 6 points] Two firms, A and B, supply a market for an homogeneous good whose *yearly* demand is $q = 10 - p$. Both firms produce the good at a constant marginal and average cost of 4. These firms compete in prices, which they set simultaneously and independently at the beginning of each year. Denote the common discount factor by δ.

(i) Can the two firms tacitly collude? Quantify and explain.

(ii) What is the optimal collusive price? Quantify and explain.

At the beginning of each year, when they simultaneously and independently set a price, both firms know that they will definitely be in business during the current year. However, they both fear "revolutionary" competition, i.e., the appearance of a competitor that will fully snatch the market forever. In particular, each firm associates a probability $1 - p$ to the appearance of a revolutionary competitor in each of the subsequent years. Thus, the probability of A and B remaining in business next year is p, two years from now is p^2, three years hence is p^3, and so on. To see it, recall that the probability of being in business in four years' time equals the probability of not facing entry in each of the next four years, which equals $p \times p \times p \times p$.

(iii) Under which condition will the two firms be able to tacitly collude? Quantify and explain.

If you did not answer the previous question, assume the required condition to be $\delta > \frac{1}{2p}$ in order to be able to answer the following questions.

(iv) Is tacit collusion easier or harder to sustain in this case compared to the case when entry was not a concern? Explain.

(v) Are there values of p for which tacit collusion becomes unattainable? Quantify and explain.

(vi) We have concluded that "revolutionary" entry affects firms' ability to sustain tacit collusion. Can we generalize the previous conclusion to the case in which entry is not revolutionary, i.e., the incumbents and the entrant share the market upon entry? Explain without quantifying (you may assume that the entrant is as efficient as the incumbents).