Final Exam

September 25, 2017

1. General information:

a. Make sure that your final exam is complete. The final exam consists of 5 problems.
b. Only use the paper provided to you. Write your student ID number immediately and clearly on each page!
c. Please do not remove the staples from the provided sheet of paper.
d. Items allowed at your workplace: Student ID, writing utensils, ruler, set square, non-programmable calculator, food and drinks.
e. Items not allowed at your workplace: Red pen, ink eraser, pencil case
f. Use a permanent pen (no pencil).
g. Mobile phones have to be turned off and removed from your place!

2. Hints about doing the exam:

a. Read each task carefully. The tasks could be extended over several pages.
b. Please complete all tasks. Begin each one on a new page. Please write your answers in a readable way.
c. You may write your answers in English or in German.
d. Label the axes of your illustrations.
e. The exam must be completed within 90 minutes!

Good luck and much success!

Problem 1 (25P)

Consider a homogenous goods market in which $n = 2$ profit-maximizing firms compete. The indices $i = 1$ and $i = 2$ refer to firm 1 and firm 2, respectively. Market demand can be described by the function $q(p) = 1500 - p$ where q denotes aggregate output and p the market price. The production of the good requires no fixed costs and marginal costs are constant at $c_1 = 100$ and $c_2 = 200$.

a) Assume the firms compete in quantities (Cournot competition). Determine the equilibrium quantities, prices and profits as well as consumer surplus.

b) Suppose firm 1 acts as a Stackelberg leader. Determine the equilibrium quantities, prices and profits as well as consumer surplus.

Consider the same setup as in b). However, firm 1 is the incumbent and firm 2 is a potential entrant. In order to enter the market firm 2 has to make an investment of $F = 12100$.

c) Determine the output of firm 1 which is necessary to deter firm 2's entry.

d) How does the result change for $F = 102400$? Interpret your result.

e) Assume that $F = 0$ holds. In case of entry, the firms will compete in prices (Bertrand competition). What price can firm 1 charge in order to deter entry?

Problem 2 (20P)

Consider a market with two different groups of consumers $i \in \{1,2\}$ with demand functions $q_1(p_1) = 100 - p_1$ and $q_2(p_2) = 70 - p_2$. The groups are of equal size. There is a profit-maximizing monopolist serving both groups. Production does not entail any costs.

a) Suppose the monopolist practices third degree price discrimination. What will be the optimal prices? What is the maximum profit? Will both groups be served?

b) Determine the optimal two-part tariff (f, p) if both groups are to be served. Here, f constitutes a fixed fee. Is it optimal to serve both groups? (Hint: The monopolist still cannot identify the consumers)

c) The monopolist now considers using menu pricing. Explain shortly and verbally how the monopolist can design a menu (f_i, q_i) for all $i \in \{1,2\}$ to maximize his profits. Also address the differences to b). Can the monopolist increase profits compared to the situation in b)?

Problem 3 (15P)

Suppose a monopolist provides two vertically differentiated goods L and H. The marginal costs for the production these goods are $c_L = 500$ and $c_H = 5000$, respectively. The quality of the goods can be indicated by $s_H = 10$ for good H and $s_L = 2$ for good L. Consumers' net utility can be described by the function $U = \theta s_i - p_i$, $i \in \{L, H\}$, where θ is a parameter measuring preference for quality of each consumer and p_i being the price of good i. The parameter θ is uniformly distributed with support $[0,1000]$. There are $N = 1000$ costumers.

   a) Determine the demand functions for each of the two goods.
   b) Derive the profit maximization problem of the firm and determine the optimal prices. Calculate the maximum profit.

Problem 4 (10P)

Consider a duopolistic, homogenous goods market. The firms $i \in \{1,2\}$ compete in prices p_i and have capacity constraints $\bar{x}_i$. The demand function is $x(p) = 250 - p$. Marginal costs of production are $c = 50$ for both firms. Costumers book in a random order and independent of their willingness to pay (proportional rationing).

   a) Suppose that capacities are $\bar{x}_i = 50$ for both firms. Firm 1 charges a price $p_1 = 150$. Show that firm 2 has no incentive to charge a different price than firm 1.
   b) Assume now that both firms have production capacities of $\bar{x}_i = 75$. Is $p = 100$ an equilibrium? Interpret your results.

Problem 5 (15P)

Describe a profit maximizing monopolist's rationale to introduce several, horizontally differentiated varieties of a product. What kind of model can be used to analyze that problem? Explain the basic concept of such a model both verbally and graphically and give an economic example for an application of the model.