Final Exam

March 2, 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 <u>not</u> 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. (8.5P)

   b) Suppose firm 1 acts as a Stackelberg leader. Determine the equilibrium quantities, prices and profits as well as consumer surplus. (6P)

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. (4.5P)

   d) How does the result change for $F = 160\,000$? Interpret your result. Also address the incumbent's credibility problem when it comes to production capacities. (4P)

   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? (2P).

Problem 2 (20P)

Consider a market for shoes which is served by a profit-maximizing monopolist. Consumers perceive shoes as horizontally differentiated goods. Their preferences can be described by a Hoteling line with a total population of $N = 10000$ being uniformly distributed on the interval $[0,1]$. Consumers' net utility is $V = 100 - |x - x_i| - p$, where p is the market price, x is the location of the consumer and x_i is the location of variant. Each consumer buys exactly one pair of shoes if her net utility exceeds zero (unit demand). The introduction of a new variant entails costs of $F = 250$. Marginal costs of production are 20.

   a) Assume that the market is covered. Determine the profit-maximizing number of variants as well as their locations on the Hoteling line (11P).

   b) What is the socially optimal number of variants? Explain in at most three sentences the differences to your solution in a). (9P)

Problem 3 (15P)

Suppose a monopolist provides two vertically differentiated goods L and H to a total of $N = 1000$ costumers. The marginal costs for the production of 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 $[0,1000]$.

a) Determine the demand functions for each of the two goods. (6P)

b) Derive the profit maximization problem of the firm and determine the optimal prices. Calculate the maximum profit. (7P)

c) Is the market covered given the profit maximizing strategy of the monopolist? Explain your result verbally in at most 2 sentences. (2P)

Problem 4 (10P)

Consider a duopolistic, homogenous goods market. The firms $i \in \{1,2\}$ compete in prices p_i and produce output subject to 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. (5P)

b) Assume now that both firms have production capacities of $\bar{x}_i = 75$. Can $p = 100$ be the equilibrium price? Explain your answer shortly. (5P)

Problem 5 (15P)

Describe the different types of price discrimination. Focus on the monopoly case. Give examples of the different kinds of price discrimination and explain the problems that can arise for the monopolist when she tries to introduce discrimination.