EXERCISES FOR BUSINESS ECONOMICS

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Chapter 1: On perfect competition

Market surveys show that there are two types of consumers for frozen yogurt. The first type like frozen yogurt and have an inverse demand of $P_1(q) = 12 - q$; the second type are crazy about yogurt and have an inverse demand of $P_2(q) = 18 - q$. In the town of Smallville there are only 2 consumers: one of them likes frozen yogurt and the other is crazy about frozen yogurt.

(a) Determine and plot the market demand for yogurt in Smallville.

Suppose now that competitive firms supply the market and that the total supply curve is given by $S(p) = p$.

(b) Find the equilibrium price and quantity. How much does each consumer buy at the equilibrium price? Determine the surplus of each type of consumers.

Chapter 2: peak-load pricing

We consider a monopoly firm with marginal cost c. The demand varies with $D_1(p) = a_1 - b_1 p$ in period 1 and $D_2(p) = a_2 - b_2 p$ in period 2, with $a_1/b_1 > a_2/b_2$.

1. Characterize the profit-maximizing price for each period.
2. Compare the two prices and discuss.

We assume now that, before choosing its production, the firm must choose the size of the infrastructure Q with a marginal cost of investment C assuming that $C < \frac{(b_2 - b_1)}{b_1} c$. To produce q at a given period, the initial investment should be at least $Q \geq q$. To keep things simple, we assume that $a_1 = a_2 = 1$.

3. For a given production q_1 in period 1 and q_2 in period 2, write down the total cost of production.
4. Assuming (and checking ex-post) that $q_1 > q_2$, characterize the profit-maximizing prices for the two periods. Comment.
5. What size Q should the firm choose at the initial stage?

Chapter 3: Price Discrimination

A monopolist faces some consumers (called group-I consumers) with an inverse demand function for **each consumer** given by $P = 80 - Q$. The firm's cost function is given by: $C(Q) = 10Q$.
Suppose first that the firm only uses linear pricing.

1. Find the the price maximizing the firm's profits.
2. What are the corresponding profit and surplus per consumer?

Suppose now that the firm can use two-part tariffs (p, F), with p the unit price and F the fixed part.

3. For any value of p, compute the surplus of the consumer and thus the maximum value F the firm can set to induce consumption (i.e. the total consumer surplus cannot be negative).
4. Assuming that the firm chooses this maximum value, compute the profit-maximizing unit price p and then the fixed part F.
5. Compute the firms profit per consumer and compare with the one found in the linear pricing case. Comment.

Suppose now that there is a new group of consumers, called group II, with an inverse demand function per consumer given by $P = 60 - Q$, and that the firm cannot tell whether a consumer belong to group I or II. Suppose that the firm proposes a new two-part tariff $(\hat{p}, \hat{F})$ with $\hat{p} = 10$ and $\hat{F} = 1250$.

6. Show that both types of consumers (group I and II) prefer this new tariff to the one found in question (4).
7. Explain how the firm should change the tariffs to maximize its profit and ensure that the group-I consumers choose the adjusted (p,F) while the group-II consumers choose the adjusted $(\hat{p}, \hat{F})$. NB: you are not required to compute formally the new profit-maximizing tariffs.

Chapter 4: Rebel without a Cause

Two drivers drive towards each other on a collision course: one must swerve, or both may die in the crash, but if one driver swerves and the other does not, the one who swerved will be called a "chicken", meaning a coward.

Consider the game described by the matrix form below.

	Stay	Swerve
Stay	(-10 ; -10)	(1 ; -1)
Swerve	(-1 ; 1)	(0 ; 0)

(a) Briefly explain why this matrix is a good representation of the situation depicted above.

(b) Find the two Nash equilibria of the game. Does one equilibrium Pareto-dominate?

(c) In light of the game studied previously, discuss briefly the following historical episode (from the Wall Street Journal, 26/08/2017): "Following the Greco-Persian Wars (499-449 B.C.), Athens built up the Delian League, while Sparta led the Peloponnesian League. Each nation kept its respective allies in line through a combination of bribery and force. Facing off with rising stakes, both sides assumed the other would stand down first, but the strategy backfired. Around 432 B.C., the Athenian leader Pericles tried to isolate Corinth, a member of the Peloponnesian League, by declaring a trade embargo against one of Corinth's allies. Pericles assumed that the Spartans wouldn't have the stomach to go to war for the sake of one League member. But neither superpower was willing to lose face, and the miscalculation led to the Peloponnesian War and the eventual ruin of Athens."

Chapter 5: Limit pricing

We consider a situation in which 2 firms, F1 and F2, compete proposing differentiated products, with the same marginal cost $c = 1$ and a fixed cost of $K = 49/128 \approx 0,38$. The consumers are uniformly distributed over the segment [0,1], and we assume that the differentiation (or taste intensity) parameter t is equal to 1.

1. As a function of the prices p_1 and p_2 set by the two firms, write down first the demand that is addressed to each of them and then their profit function.

2. For each firm, derive the reaction function, that is its best choice of price as a function of the price chosen by the other.

3. Assuming that both firms choose their price simultaneously, characterize the choice of price at the Nash equilibrium and derive the profit of each firm.

We now assume that F1 chooses its price first, and then F2 reacts optimizing its own price. We want to show that in this situation where the choices are sequential, F1 may want to choose alow enough price to deter F2 from entering the market (this is called a limit pricing strategy). Hint: sequential games should be solved by backward induction, that is by solving first the last period, and then the before last, and so on.

4. Derive the price optimally chosen by F2, taking as given the price choice of F1. What is (as a function of p_1) the profit formula of F2?
5. How should F1 set its price to induce zero profit for F2 (taking into in account the fixed cost)? Assuming that F2 leaves the market in this case, what is then F1's profit?
6. Show that this limit pricing strategy allows F1 to make a higher profit than in a standard situation in which both firms choose their price simultaneously.