

Economics 100A
Fall 2001
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PROBLEM SET #10
(Due in section the week of November 12, 2001)

1 Monopoly Behavior (Ch. 25)

1.1 Price Discrimination

Problem 1 *Suppose Napster is considering selling music via email. There are two types of users, Students and Non-Students. Each Non-Student has an inverse demand function, $p_N(x) = 200 - x$, and each Student has an inverse demand function, $p_S(x) = 160 - x$, where x is the number of songs delivered by email (p is measured in cents). The marginal cost to Napster of sending an additional song via email is ZERO. (For the following questions, it may be helpful to graph the two demand curves)*

1. Suppose Napster can identify all users as either Students or Non-Students. If Napster offers a fixed number of songs per year to each person, what is the profit maximizing level of songs offered to a Student (x_S) and a Non-Student (x_N)? In other words what is the equilibrium level of output for each type of person under first-degree price discrimination (i.e. perfect price discrimination).
2. What is the dollar price charged to Students (p_S) and Non-Students (p_N) per year (Note: the price in the demand function is in cents)?
3. Suppose Napster CANNOT identify users as Students or Non-Students. If Napster offers a bundle of 160 songs, what is the maximum price that Students will pay?
4. What is the gross consumer surplus (i.e. area under the demand curve up to $x = 160$) that Non-Students enjoy if they consume 160 songs per year at the price from (3)? What is the net consumer surplus?
5. What is the maximum price Napster can charge for 200 songs per year if it offers 160 songs per year at the highest price Students are willing to pay?
6. If Napster offers a "Student Package" of 140 songs per year, what is the most it can charge and still get Students to buy?
7. How much net consumer surplus does a Non-Student get from buying the "Student Package"?

8. What is the most Napster can charge for the 200 song "Non-Student Package" if it is offering the 140 song "Student Package" at the price from (6)?
9. Assuming there is only one Student and one Non-Student in the population, does Napster make more profit by offering the 160 song "Student Package" or the 140 song "Student Package"?
10. (Difficult) In general, if Napster cannot distinguish between Students and Non-Students, what areas of the graph is Napster trying to maximize (see page 437, Figure 25.3.C). What are the optimal (profit maximizing) bundles (x_S, x_N) for Napster to offer and prices (p_S, p_N) for Napster to charge assuming the number of Students equals the number of Non-Students. [Hint: Napster wants to maximize the area $2A + C + D$. Write this area as a function of output (x) , and solve for the maximum (x^*)].

2 Game Theory (Ch. 28)

Definition 1 A Nash Equilibrium (for a 2-player game) is a set of strategies (s_1^*, s_2^*) such that the strategy for player 1, s_1^* , is the best response (in terms of payoffs) to the strategy of player 2, s_2^* , and vice versa.

Problem 2 Consider the following game.

		Player 2	
		d	e
Player 1	A	(4, 9)	(4, 9)
	B	(6, 5)	(0, 1)
	C	(8, 7)	(3, 2)

1. What are the pure strategy Nash equilibria of this game?
2. Write this game in extensive form as a sequential game with Player 1 moving first.

Definition 2 The backwards induction outcome of a sequential game (under complete and perfect information) is solved by finding Player 2's best strategy (e.g. d or e) under EACH strategy (e.g. A, B, and C) for Player 1. Player 1 then selects the strategy (A, B, or C) that gives the highest payoff among Player 2's best strategies.

3. Solve for the backwards induction outcome.

Problem 3 (Difficult) A dollar is to be divided between two people. The two people simultaneously announce shares, s_1 and s_2 . If $s_1 + s_2 \leq \$1$ then each person gets his announced share. Otherwise, if $s_1 + s_2 \geq \$1$, then the payoff to each is \$0. What is the SET of pure-strategy Nash equilibria for this game? (Hint: Think about the best response of each player given a particular announcement (or share) from the other player).