

## Problem set 4

due Thursday, November 4th by 9:30am

1. Apple charges \$699 for its Mac mini computer, even though its marginal cost of production is only \$427 per computer. Assuming that Apple is charging the profit-maximizing price,

a. What is Apple's Lerner index? (Hint: the Lerner index is a measure of monopoly power and is equal to  $\frac{p-mc}{p}$ .)

b. What is Apple's elasticity of demand?

2. A monopolist faces the demand curve  $p = 11 - q$ , where  $p$  is measured in dollars per unit, and  $q$  is thousands of units. The monopolist has a constant average cost of \$6/unit.

a. Draw the demand and marginal revenue curves, and the average and marginal cost curves. What are the monopolist's profit-maximizing price and quantity? What profit does it earn? Calculate the firm's degree of monopoly power using the Lerner index.

c. What price ceiling yields the largest level of output? What is that level of output? What is the firm's degree of monopoly power at this price?

3. A drug company has a monopoly on a new patented medicine. The product can be made in either of two plants (or at both). The costs of production for the two plants are  $MC_1 = 20 + 2q_1$  and  $MC_2 = 10 + 5q_2$ . The firm estimates demand for the medicine is  $p = 20 - 3q$ .

How much should the firm produce in each plant? At what price should it sell its product?

4. Suppose that an industry is characterized as follows:

$$c(q) = 99.5 + 2q^2 \quad \text{each firm's total cost function}$$

$$MC = 4q \quad \text{each firm's marginal cost}$$

$$p = 90 - 2q \quad \text{industry demand curve}$$

a. If there is only one firm in the industry, find the monopoly price, quantity, and level of profit.

b. Find the price, quantity, and level of profit if the industry is competitive.

5. A monopolist is deciding how to allocate output between two geographically separated markets (the East coast and the West coast) Demand for the two markets is

$$p_E = 15 - q_E$$

$$p_W = 25 - 2q_W$$

The monopolist's total cost is  $c(q_E + q_W) = 5 + 3(q_W + q_E)$ .

a. To maximize its profits, what price should the monopolist charge in each market, and what quantity should it sell to each market, supposing it is able to charge different prices in each market? What will its profits be?

b. Now suppose that the monopolist is constrained to be unable to price discriminate. What price should it charge, and what quantity will it sell to each market? What will its profits be?

**6.** An airline has two types of customers who fly a given route, tourists and business travelers. Say that tourists have demand function  $p = 20 - q$ , where  $q$  is the quality level for the seat in which a tourist sits, and business travelers have demand given by  $p = 40 - q$ . Suppose that there is a fixed number of customers who fly this route,  $\frac{1}{8}$  of them business travelers, and  $\frac{7}{8}$  of them tourists. For simplicity, assume that the cost of providing a given quality level on a flight is 0 for the airline, and that the cost of taking on an additional passenger is also 0.

**a.** Suppose the airline can only set one quality level on this route. What quality level should the airline set, and what price should it charge for a ticket?

**b.** Now suppose it is possible for the airline to offer both a first class section and a coach section, with different quality levels. Suppose the quality and price of a coach seat is the same as the quality and price you solved for in b. What should the price of a first class ticket be to maximize profit?

**c.** Now suppose the airline reduces the quality in coach by 2 units. What is the new price in coach? In first class? Show that this quality reduction increases the airline's profits.

**Problem 7** John runs a car washing service with 9 potential customers. John has a marginal cost of \$8 per wash. The price that each customer will pay John to wash her car is listed below:

Customer	willingness to pay
Abby	\$35
Bianca	\$16
Chloe	\$23
Diana	\$22
Erin	\$31
Faisal	\$14
Greg	\$10
Hernan	\$7
Igor	\$2

**a.** Suppose that John must charge the same price to all of his customers (he is a single-price monopolist). What price does he charge and how many washes does he sell?

**b.** Suppose now that it is possible for John to price discriminate. Now how many washes will John sell?

**Problem 8** Discuss (in a couple of sentences) the central tradeoffs policy makers face in determining for how long patents should be valid.