

Exercises Industrial Organization

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Part One

1. Consider a market in which the demand curve is given by:

$$P = 300 - Q$$

Total costs for the industry is given by $TC = 20Q$.

- (a) What is the competitive price? What are industry profits?
- (b) Represent your answers in a graph and shade the area of consumer surplus, producer surplus and any efficiency loss for the market structure.
- (c) What is the monopoly price? What are profits?
- (d) Represent your answers in a graph and shade the area of consumer surplus, producer surplus and any efficiency loss for the market structure.
- (e) Calculate the Lerner Index.

2. Let the cost of function be $C = 2 + 3q^2 + 8q^3 + 6q^4$.

- (a) Derive an expression for average cost and for marginal cost.
- (b) Is there any range of production characterized by diseconomies of scale? At what production level are scale economies exhausted?

3. The technology of a given firm can be expressed by the following production function:

$$Y = 30KL - K^2 - 2L^2$$

and it has been used the following amounts of inputs: $K=50$ and $L=10$.

- (a) Determine the amount of output.
- (b) Which input has the greater impact on the output?

4. The demand function of the market is equal to $q = 40 - p$ and the cost function of a monopolist is $C = 4q$.

(a) Determine the quantity, the price and the profits of the firm.

(b) Compute the Lerner Index.

5. The demand function of the market is equal to $q = 16 - p$ and the cost function is $C = 2q^3 - 7q^2 + 16q$.

(a) Determine the quantity, the price and the profits of the monopolistic firm.

(b) Compute the Lerner Index.

6. A monopolistic firm adopts a technology described by the following production function:

$$Q = \min\{K, L\}$$

where K is the capital and L is the labor. Suppose that the price of the two inputs are equal to 2 and the inverse demand function is $p = 16 - Q$.

(a) Determine the quantity, the price and the profits.

7. Suppose that the inverse demand function is $p = 20 - q$ and the cost function is: $CT = 2q$.

(a) Compute the quantity and the price under monopoly.

(b) Determine the consumer, the producer and the total surplus mathematically and graphically.

(c) The consumer surplus under perfect competition and the loss deriving from monopoly.

8. Consider a monopolistic firm with the inverse demand function equal to $p = 800 - 3q$. In order to produce a product, the monopolist uses two plants: A and B. The total cost function of plant A is: $C(A) = 2q_A^2$, while the total cost function of plant B is: $C(B) = 4q_B + q_B^2$.

(a) Derive the optimal levels of production shared by the two plants.

9. Suppose that the cost function of a firm is $CT = 21 + 8q$. Show that it is less expensive to produce the quantity q of the good with a unique firm than with two firms.
10. Assume that there are N firms in the market. Every firm in the market has a cost function equal to: $TC_i = q_i$ and the inverse demand function equal to $p_i = \frac{4-q_i}{N}$ with $i = 1, \dots, N$.
- Determine the quantity, the price and the profits under monopoly, i.e. $N=1$.
 - Determine the quantity, the price and the profits when $N > 1$.
 - Optimal number of firms in the market.
11. Las-O-Vision is the sole producer of holographic TVs, 3DTVs. The daily demand for 3DTVs is $D(p) = 10200 - 100p$. The cost of producing q 3DTVs per day is $\frac{q^2}{2}$.
- What is Las-O-Vision's total revenue schedule?
 - What is Las-O-Vision's marginal revenue schedule?
 - What quantity and price does Las-O-Vision charge per 3DTV? What is its daily profit?
12. You own a private parking lot near U.C. Berkeley with a capacity of 600 cars. The demand for parking at this lot is estimated to be $Q = 1000 - 2p$, where Q is the number of customers with monthly parking passes and p is the monthly parking fee per car.
- Derive your marginal revenue schedule.
 - What is your profit maximizing price?
 - Your fixed costs of operating the parking lot, such as the monthly lease paid to the landlord and the cost of hiring an attendant, are 25,000 dollars per month. In addition, your insurance company charges you 20 dollars per car per month for liability coverage, and the City of Berkeley charges you 30 dollars per car per month as part of its policy to discourage the use of private automobiles. Check that it is not optimal to shut down.
13. An industry consists of five firms with sales of 200 000 dollars, 500 000 dollars, 400 000 dollars, 300 000 dollars, and 100 000 dollars.

- (a) Calculate the Herfindahl-Hirschman index (HHI) and the four-firm concentration ratio (C4).

14. Based on the information given, indicate whether the following industry is best characterized by the model of perfect competition or monopoly.

- (a) Industry A has a four-firm concentration ratio of 0.0001 percent and Herfindahl-Hirschman index of 55. A representative firm has a Lerner index of 0.0034.
- (b) Industry B has a four-firm concentration ratio of 100 percent and Herfindahl-Hirschman index of 10 000. A representative firm has a Lerner index of 0.4.