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EE311 Microeconomics Theory, Semester 2/2019
Homework Assignment #5 | Due date: Friday 27 March 2020

Instruction:

- 1) Attempt all questions.
- 2) You may study and discuss in group but you have to write up your solutions independently and by handwriting only. Copying and/or Plagiarism is considered as a serious crime in academic arena and it will not be tolerated. If detected, all parties involved receive 'zero.'
- 3) If you have any questions, please feel free to email me at pongpalin@econ.tu.ac.th

Monopoly (CH 11)

1. Algebraically show that the marginal revenue for a monopolist is less than the market price for positive quantities of output. Also, explain WHY.

10. Suppose that Intel has a monopoly in the market for microprocessors in Brazil. During the year 2005, it faces a market demand curve given by $P = 9 - Q$, where Q is millions of microprocessors sold per year. Suppose you know nothing about Intel's costs of production. Assuming that Intel acts as a profit-maximizing monopolist, would it ever sell 7 million microprocessors in Brazil in 2005?

(Hint: Find MR at $Q = 7$, and then interpret its value in order to

answer the question.)

14. Suppose a monopolist has a constant marginal cost $MC = £50$ and faces a demand curve $P = 100 - Q/2$ (which can be rewritten as $Q = 200 - 2P$).

(a) Find the profit-maximizing price and quantity using the monopoly midpoint rule.

(b) Find the profit-maximizing price and quantity by equating MR to MC.

16. A monopolist serves a market in which the demand is $P = 120 - 2Q$. It has a fixed cost of 300. Its marginal cost is 10 for the first 15 units ($MC = 10$ when $0 < Q < 15$). If it wants to produce more than 15 units, it must pay overtime wages to its workers, and its marginal cost is then 20. What is the maximum amount of profit the firm can earn?

(Hint: When $MR = MC = 10$, is it true that $0 < Q < 15$?)

18. Suppose a monopolist has an inverse demand function given by $P = 100Q^{(-1/2)}$. What is the monopolist's optimal mark-up of price above marginal cost?

(Hint: Find $(P - MC)/P$.)

Interpretation of IEPR

For example, if $(P - MC)/P = 1/4 = 25\%$, this means that the optimal PERCENTAGE mark-up of price over marginal cost is $1/4$ or 25%.

19. The marginal cost of preparing a large latte in a specialty coffee house is \$1. The firm's market research reveals that the elasticity of demand for its large lattes is constant, with a value of about -1.3 . If the firm wants to maximize profit from the sale of large lattes, about what price should the firm charge?

20. Imagine that Gillette has a monopoly in the market for razor

blades in Mexico. The market demand curve for blades in Mexico is $P = 968 - 20Q$, where P is the price of blades in cents and Q is annual demand for blades expressed in millions. Gillette has two plants in which it can produce blades for the Mexican market: one in Los Angeles and one in Mexico City. In its L.A. plant, Gillette can produce any quantity of blades it wants at a marginal cost of 8 cents per blade. Letting Q_1 and MC_1 denote the output and marginal cost at the L.A. plant, we have $MC_1(Q_1) = 8$. The Mexican plant has a marginal cost function given by $MC_2(Q_2) = 1 + 0.5Q_2$.

(a) Find Gillette's profit-maximizing price and quantity of output for the Mexican market overall. How will Gillette allocate production between its Mexican plant and its U.S. plant?

(Hint: Find TOTAL MC of the multi-plant monopolist and then set $MC_{\text{Total}} = MR$)

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1. This is due to the price effect of a monopolistic firm. The price effect forces a monopolistic firm to lower price as it is trying to sell an additional output. This means that they also gain less revenue from the previous unit sold as well since the price of all units must be the same therefore, the MR is less than P for a monopolistic firm.

10. $P = 9 - Q \therefore MR = 9 - 2Q$

$$Q = 7$$

$$MR = 9 - 2(7) = -5$$

At the quantity of 7 million, Intel's MR is negative therefore, Intel will choose to produce at a lower quantity.

- 14a. If MC is constant, we can apply the mid-point rule (between intercept of demand curve and the MC point).

$$\text{Int of demand curve} = 100$$

$$\text{MC point} = 50$$

$$\text{Midpoint} = 75$$

14b. $P = 100 - \frac{Q}{2} \therefore MR = 100 - Q$

$$100 - Q = 50$$

$$Q = 50$$

16. $P = 120 - 2Q \therefore MR = 120 - 4Q$

$$MC (0 < Q < 15) = 10$$

$$MC (Q > 15) = 20$$

If we assume optimality at $0 < Q < 15$ then

$$120 - 4Q = 10$$

$Q = 27.5$ which is more than 15 and that is not feasible. therefore we choose to produce more than 15.

$$120 - 4Q = 20$$

$$Q = 25$$

$$\text{Market } P = 100 - 2(25) = 70$$

$$\text{Revenue} = PQ = 70(25) = 1750$$

$$\text{Variable Cost} = 10(15) + 20(10) = 350$$

$$\text{Fixed Cost} = 300$$

$$\text{Profit} = 1750 - 350 - 300 = 1100$$

$$18. \quad P = 100 Q^{-1/2}$$

$$\sqrt{Q} = \frac{100}{P}$$

$$Q = 10000 P^{-2} \therefore \text{demand elasticity} = -2$$

$$\frac{P - MC}{P} = \frac{1}{2} \quad \text{or } 50\% \text{ mark up price.}$$

$$19. \quad \frac{P-1}{P} = \frac{-1}{1.3} \therefore \$4.33 \text{ per coffee latte should be charged to maximize profit}$$

$$20. \quad P = 968 - 20Q \quad \text{Plant 1: } MC_1(Q_1) = 8 \quad \text{Plant 2: } MC_2(Q_2) = 140Q_2$$

$$MR_T = 968 - 40Q$$

$$MR = MC_T \quad 968 - 40Q = 8$$

$$Q = 24 \text{ should be produced overall}$$

$$MR = 968 - 40(24) = 488 \text{ so } \$488 \text{ of blade overall}$$

$$CMC_2$$

$$1 + 0.5 Q_2^* = 488 \quad \text{At Mexico } \therefore 9.74 \text{ is the unit of production at Mexico}$$

$$\text{At L.A., } Q_T^* = Q_1^* + Q_2^* \therefore 24 = Q_1^* + 9.74$$

$$Q_1^* = 14.26$$