

Instructions

- (1) Please read the instruction carefully.
- (2) Please read each question carefully and answer the questions straightforwardly. Always provide economic reasons at least a paragraph for your analysis, or a graph when necessary, even when the question does not indicate so.
- (3) Handing and submitting assignments are only available via BE Moodle.

Answering the questions and preparing answer sheets

- (1) Answers are to be handwritten, in either digital or analog form, in a blank canvas or any clean paper. Make sure that your handwriting is clearly visible and readable.
- (2) There is no need to rewrite the question. Just indicate the question number clearly for each of the answer, such as 1.a).
- (3) When done, for the digital case, collage all the pages into a single PDF file. For those who write on sheets of paper, take photo of all pages then convert all of them into a single PDF file as well.
- (4) Name your PDF file as StudentID_YourNickname, such as 640123456_Bo.

Submitting your answers

- (1) Make sure your file does not exceed 10MB. This is the maximum file size for BE Moodle upload.
- (2) Login to BE Moodle, head into the course, then the assignment topic.
- (3) Choose your file to submit. Done. There will be timestamp for your upload date and time, so please make sure to not submit later than that.

1. Consider a long-run production in which there are only two inputs labor and capital, and the input prices for labor and capital are wage (w) and interest rate (r), respectively. Suppose that at the equilibrium levels of labor and capital (L^*, K^*), the marginal product of labor (MP_L) and marginal product of capital (MP_K) are 6 and 8, respectively.

Isquant.

1.a) Calculate the marginal rate of technical substitution (MRTS), and state the cost-minimization conditions of this firm, given that the required output is fixed at Q_0 . If the market wage rate (w) is \$3, what is the interest rate at the equilibrium? $w = 3, r = 4$.

1.b) Suppose now that the wage rate (w) increases to \$4, *ceteris paribus*. Draw a diagram to illustrate the changes in the cost-minimizing combination of inputs.

2. Suppose that in the long-run production of wine, a firm uses two inputs: workers (L) and machines (K). At the required output of 3,000 bottles of wine, the firm's least-cost input combination is 200 units of L and 50 units of K , and the per-unit input prices for L and K are \$10 and \$20, respectively. Suppose further that at this least-cost combination of inputs, the marginal product of the 50th machine (MP_K) is 8 bottles of wine. $Tc = wL + rK$

2.a) Draw a diagram to illustrate this firm's cost-minimization decision, where L is on the x-axis and K is on the y-axis. Also, explain the firm's cost-minimization conditions. $L = 200$

2.b) At the equilibrium in part a., what is the marginal product (MP_L) of the 200th workers?

2.c) Suppose that the input price for L increases to \$15 per unit, while the input price for K and the required amount of output are the same. Draw another diagram to illustrate the change in the least-cost input combination. $w = 15$

2.d) Explain the difference between short-run and long-run production.

3. Consider a perfectly competitive market, in which the current equilibrium price is 150 baht per unit.

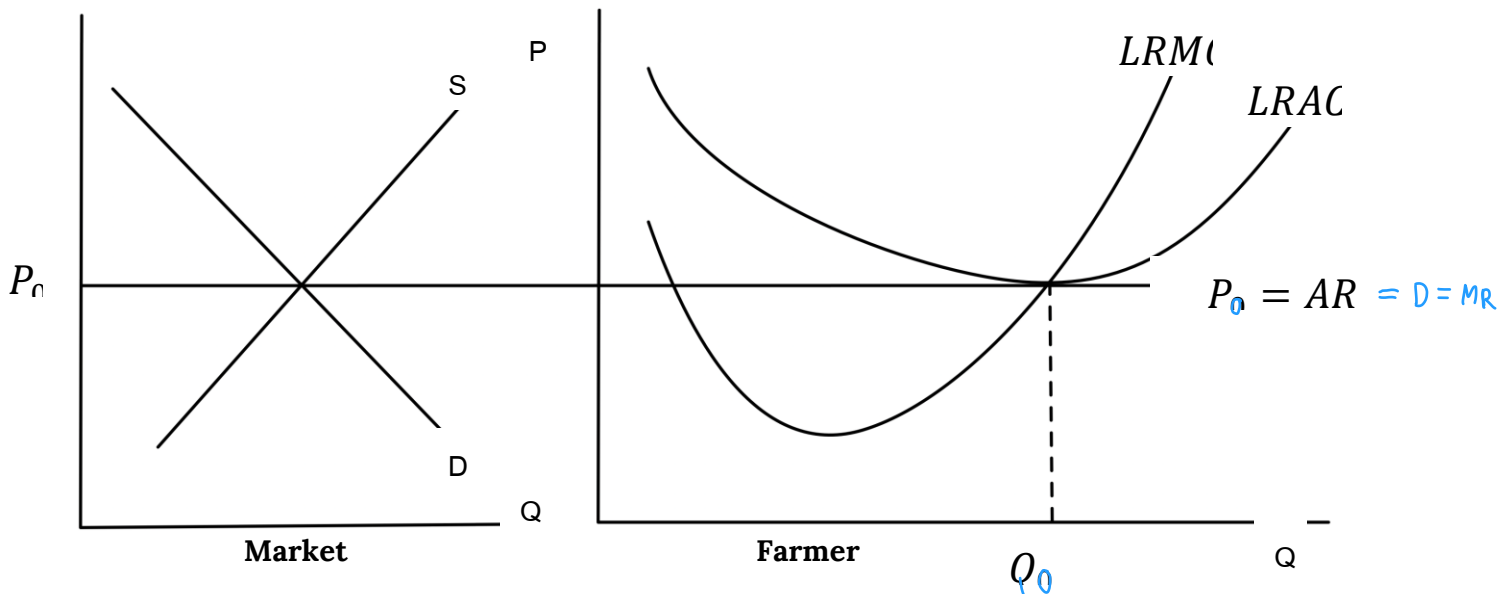
3.a) Suppose that a firm in this market sells 20 units of its output. State the profit-maximizing condition of this firm, and draw a diagram to illustrate how the equilibrium quantity is determined.

3.b) At this equilibrium quantity of 20 units, suppose that the firm's average total cost is 180 baht, and its average fixed cost is 60 baht. Calculate this firm's average variable cost, total revenue, total cost, and profit.

3.c) From part b., should this firm stay in the market in the short run? Justify your answer.

3.d) Suppose now that the market demand decreases, and the market price decreases to 120 baht per unit. Draw two diagrams to illustrate: (i) the change in the equilibrium price and quantity in the market, (ii) how the change in the market price affects the firm equilibrium quantity and profit. Would your answer from part c. change?

4. A Thai rice farmer is in a long run equilibrium in a perfect competition and produces at the quantity Q_0 as shown in the graph below.



4.a) The government grants a lump sum subsidy to every farmer. How will this change the LRAC? Explain why LRMC does not change.

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4.b) (10 Points) Will the lump sum subsidy change the quantity the farmer wants to produce to maximize his profit? Show in the graph that the farmer now earns an Excess Profit. Explain.

4.c) (10 Points) Demonstrate how this Excess Profit will affect the market price in the Long Run that allows new entry to the market.

5. House and Land (HL) is the monopolist in a luxury housing market. It is a very efficient firm in which workers can construct houses with constant marginal cost and average cost. The demand and cost functions for HL are given as follows. (P is in million-baht unit).

$$P = 60 - 0.6Q$$

$$MC = AC = 24 \quad \frac{TC}{Q} =$$

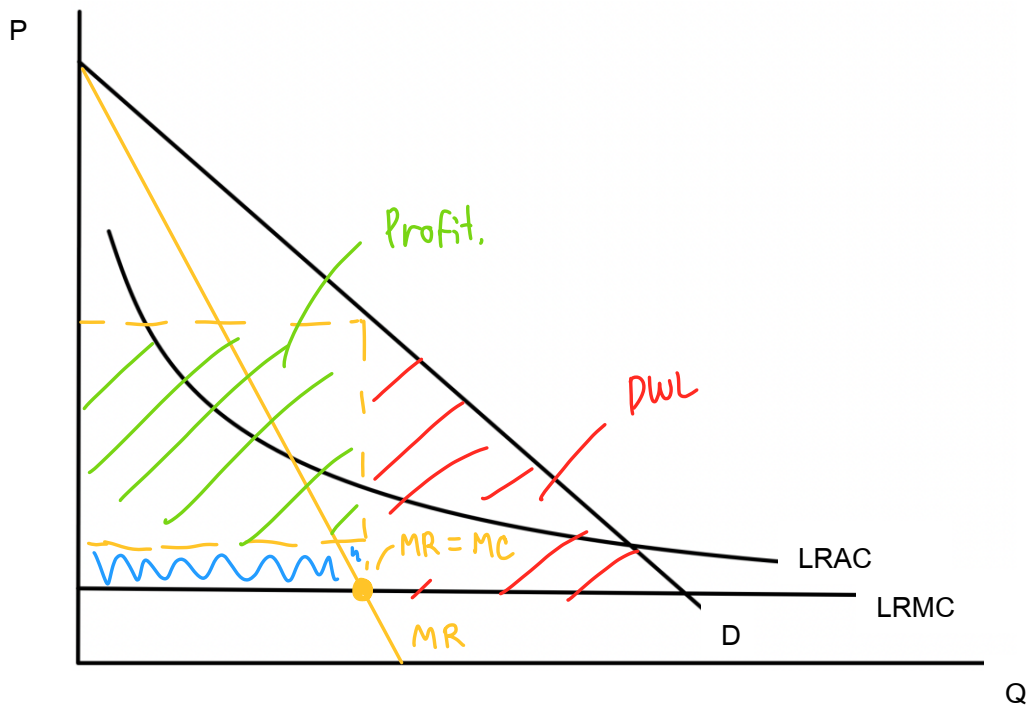
D MR .

5.a) Derive the marginal revenue function. Draw a diagram to illustrate the demand, marginal revenue, marginal cost, and average cost curves.

5.b) State the profit-maximizing condition for HL, and determine the optimal units of houses. Also, indicate the profit in the diagram, and explain how this profit can be derived.

5.c) The government tries to encourage more people to have access to luxury houses, so they launch a policy forcing HL to sell their houses at the ideal price. Draw another diagram to indicate the ideal price and determine the corresponding quantity at this price. Illustrate the social welfare before and after the intervention in the diagram and discuss.

6. The producer of the upcoming vaccine for COVID-19 is a monopoly who wants to price their vaccine to maximize profit. The cost of producing the vaccine is mostly fixed cost involving the research so that the Long Run Average Cost (LRAC) keeps declining the more vaccine is produced. The Long Run Marginal Cost (LRMC) is a small constant cost at all production level.



6.a) If the demand of vaccine is downward sloping as usual, show the equilibrium price and quantity that will maximize the profit. State the equilibrium conditions. Identify the profit and the deadweight loss to the society.

6.b) Assumed that monopoly price is \$50 per dose, marginal cost \$10, calculate the Lerner's index of monopoly power.

6.c) Determine the Ideal Price? Will the monopoly earn any profit at this Ideal Price? Explain.

6.d) Determine the Fair Price? Is there still deadweight loss at this Fair Price? Explain.

$$1.2) |MRTS_{LK}| = \left| \frac{\Delta K}{\Delta L} \right| = \frac{MPL}{MPK} = \frac{6}{8} = \frac{3}{4}$$

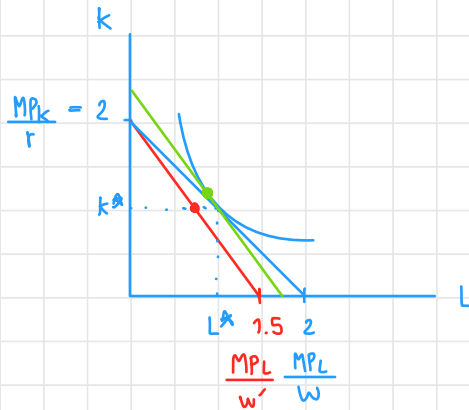
At (L^*, K^*) , the cost will be minimized where MPL and MPK at 6, 8, respectively. From the calculation above, it shows that when firms add 4 more unit of L , firms will gain product that was lost from 3 units of K . So, MPL is $\frac{3}{4}$ of MPK .

$$\text{Cost minimized where } \frac{MPL}{w} = \frac{MPK}{r}$$

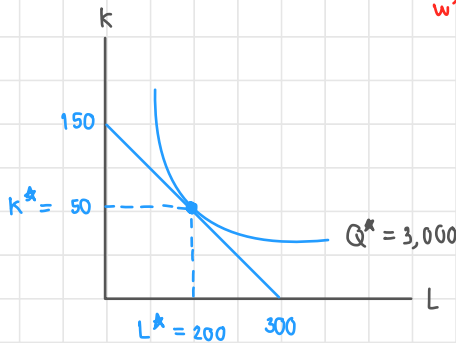
$$\frac{6}{3} = \frac{8}{r}$$

$$\therefore r = 4 \text{ at equilibrium}$$

1.b)



2.a)



$$Q^* = 3,000$$

$$TC = wL + rK$$

$$TC = 200(10) + 50(20)$$

$$TC = 3,000$$

- find k when $L=0$; $3000 = 20k$; 150
- find L when $k=0$; $3000 = 10L$; 300

The optimal choice of (K^*, L^*) that minimize the cost and yield the same amount of wine (3,000 bottles) when firm gives up 1 k , gain 2 L $\Rightarrow q(K^*, L^*) = q(50, 200) \neq$

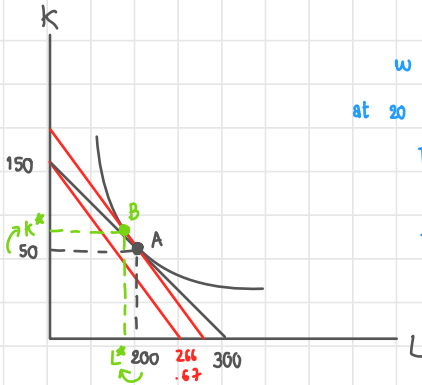
2.a) \therefore cost minimized when $|MRTS| = \left| \frac{\Delta k}{\Delta L} \right| = \frac{MPL}{MPK} = \frac{w}{r}$

$$\frac{4}{8} = \frac{10}{20} \Rightarrow \frac{1}{2} \neq$$

2.b) $\frac{MPL}{w} = \frac{MPK}{r}$

$$MPL = \frac{8(10)}{20} = 4$$

2.c)



w increases to w' (w' = 15) while r remains at 20

$$TC = wL + rK$$

$$= 15(200) + 20(50)$$

$$TC = 4,000$$

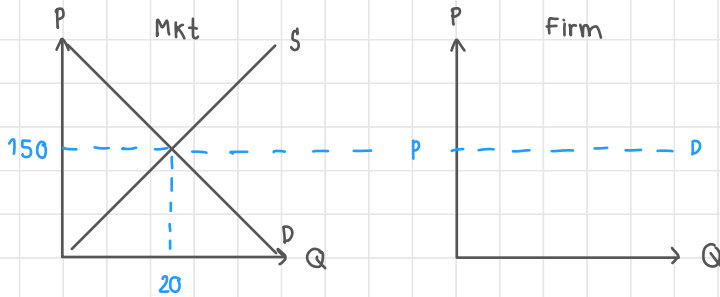
$$\text{New } K = \frac{TC}{r} = \frac{4,000}{20} = 200$$

$$\text{New } L = \frac{TC}{w} = \frac{4,000}{15} = 266.67$$

\therefore use less amount of labor, gain more capital to yield same amount as before (3,000 bottles of wine)

2.d) Production in short-run has to be at least one fixed factor of production, while production in long-run can adjust the amount of all factor of production.

3.a)



The current equilibrium price is at 150, meaning that
The profit maximization will occur when $MR = MC$

3.b)

$$\begin{aligned} \bullet \text{ AVC} &= \text{ATC} - \text{AFC} \\ &= 180 - 60 \\ \text{AVC} &= 120 \end{aligned}$$

$$\text{Note: } q = 20$$

$$\begin{aligned} \bullet \text{ total revenue} &= P \cdot q \\ &= 150 \cdot 20 \\ &= 3,000 \end{aligned}$$

$$\begin{aligned} \bullet \text{ total cost} &= \text{TFC} + \text{TVC} \\ &= 1,200 + 2,400 \\ \text{TC} &= 3,600 \neq \end{aligned}$$

$$\begin{aligned} \bullet \text{ profit} &= \text{TR} - \text{TC} \\ &= 3,000 - 3,600 \\ &= -600 \end{aligned}$$

$$\text{AFC} = \frac{\text{TFC}}{q} \quad | \quad \text{AVC} = \frac{\text{TVC}}{q}$$

$$\begin{aligned} 60(20) &= \text{TFC} & | & \quad (120)(20) = \text{TVC} \\ \text{TFC} &= 1,200 & & \quad \text{TVC} = 2,400 \end{aligned}$$

3.c)

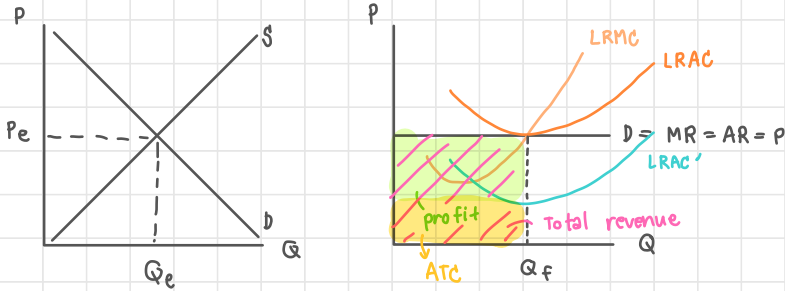
In this scenario, P still $> \text{AVC}$, meaning that firms can choose for 2 options. 1st is pay for total fixed cost at 1,200, or 2nd is producing and selling at q^* will lost 600 profit. So, firm should consider to stay in the market because they will lost at least 600 compared to -1,200 if they produce and sell nothing (only pay for total fixed cost).

3.d)

Now, the price is at 120, meaning that it equals to average variable cost ($P = \text{AVC}$). This scenario means that either pay total fixed cost or producing and selling at q^* cause the same lost. So, firms can choose both ways.

4.a) A lump sum subsidy given to farmer will lower average total cost \rightarrow \downarrow TFC. Additional decreases in fixed costs will not effect on variable costs and therefore won't effect marginal costs.

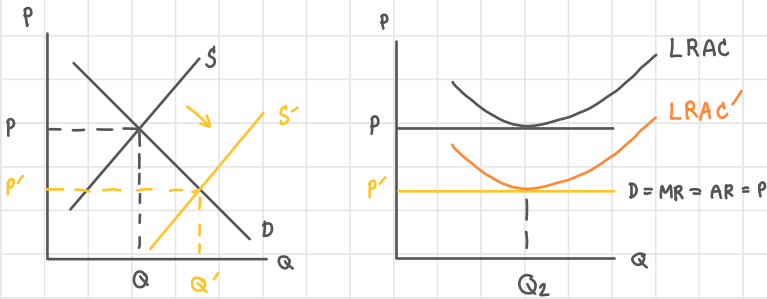
4.b)



According to the cause of subsidy given, farmers will earn profit b/c of the lower amount of fixed cost in short run. Profit = TR - TC ; will be the green area.

4.c)

In the long-run, other firms are attracted to this industry's abnormal profits and will enter the market. As more producing firms enter the market, supply increases, pushing down the market price and increasing the quantity produced. In the long-run, the price will decrease to the point that the firm is only making normal profit/ zero economic profit.

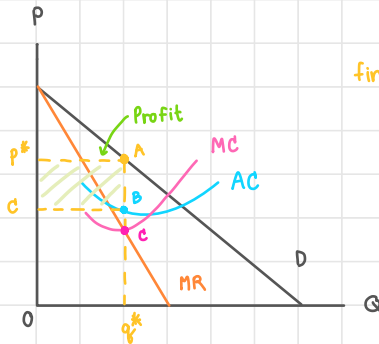


$$5.a) P(Q) = 60 - 0.6Q$$

$$\text{Total Revenue} = P(Q) \cdot Q = 60Q - 0.6Q^2$$

$$\text{Marginal Revenue} = P'(Q) = 60 - 1.2Q$$

↘ steep as twice as Demand line.



find Q when $MR = MC$

$$60 - 1.2Q = 24$$

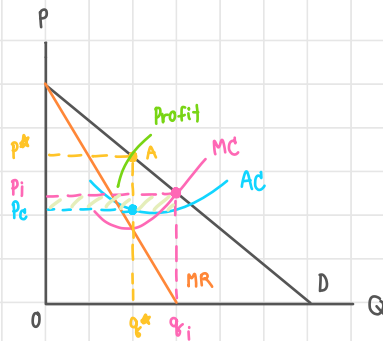
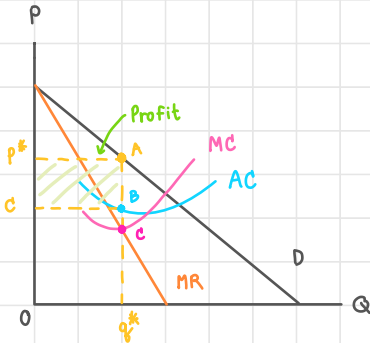
$$Q = \frac{36}{1.2} = 30$$

$$\text{find } P = 60 - 0.6(30) = 42$$

5.b) Profit will be maximized when $MC = MR$ so that the optimal unit of houses (q^*) will be at $MR = MC$ as well.

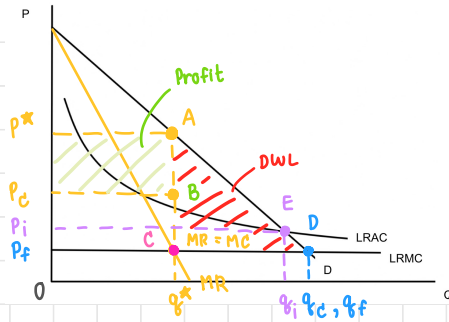
To calculate profit in monopoly market, Profit = Total Revenue - Total cost ; Profit = $OP^*Aq^* - OCBq^*$

5.c)



$P_i = MC$. The new ideal price and ideal quantity is now at (P_i, q_i) . Comparing social welfare of this firm before and after government intervention, this firm tends to have more economy profit before the government intervention when compared to the economic profit after the government intervention.

6.a)



The equilibrium price and equilibrium is at (p^*, q^*) when $MR = MC$.

Firms will gain profit by subtracting total cost from total revenue ($\text{Profit} = TR - TC$)

The dead weight loss in monopoly market will occur when $P > MC$ (Area: ACD)

6.b) Lerner's index ; $L = \frac{P - MC}{P} = \frac{50 - 10}{50} = \frac{4}{5} = 0.8$

6.c) Ideal price is set by the government functions to prevent the monopolist taking benefits from consumers. $P_i = LRAC = D$ (E)
 In this scenario, the monopolist will not gain benefits any more since the maximum profit that they can create is only in the $P_i p^* AB$ area. But the ideal price is out of that area, so it will be loss in profit for this monopolist.

6.d) Fair price is another price set by the government functions to prevent the monopolist from taking benefits from consumers. $P_f = LRMC = D$ (D). According to the graph there is no deadweight loss any more since the price is equal to $LRMC$, meaning that firm will make zero economic profit.