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.

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?

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.

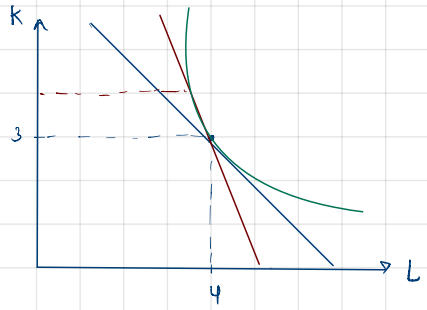
1.a) $MRTS = \frac{MP_L}{MP_K} = \frac{6}{8} = \frac{3}{4}$ ✱

cost minimization — MRTS = slope of isocost $(\frac{w}{r})$

$w = 3$, $r = ?$ $\quad [MRMS_{LK}] = \left|\frac{\Delta K}{\Delta L}\right| = \frac{w}{r} = \frac{3}{4}$

$\therefore$ interest rate = 4

1.b)



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.

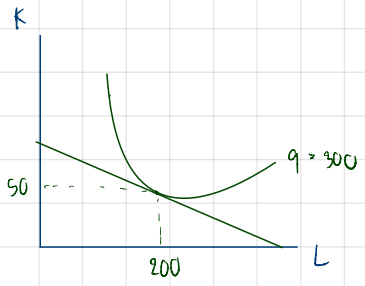
2.a) Draw a diagram to illustrate this firm's cost-minimization decision, where L is on the x-axis and K is on the y-axis. Also, explain the firm's cost-minimization conditions.

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.

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

(a)

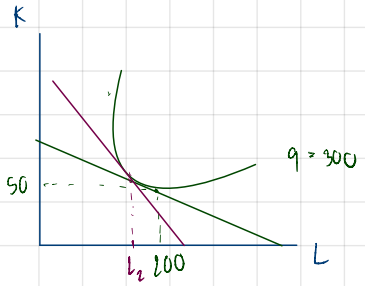


cost minimization base on firm decision by utilized all of facter of production in order to produce

(b) MPL of 200th worker → $\frac{MP_L}{8} = 3000$

$MPL = 24{,}000$ ✱

(c)



price for L increase to \$ 15 per unit
K still — 20 per unit

∴ least-cost output combination 133 unit of L
50 unit of K ✱

(d) short-run production refer to production in which on factor is fixed
long-run production refer to the production that all factors are variable
and both are not categorized by time frame of production

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

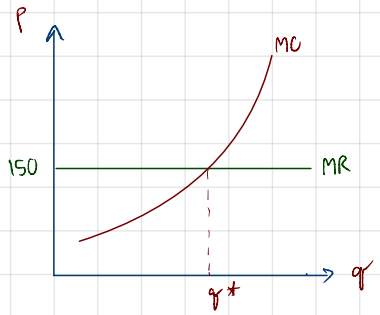
3.a) Suppose that a firm in this market sells 20 units of its output. State the profit-maximizing condition of this firm, and draw a diagram to illustrate how the equilibrium quantity is determined.

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?

(a)



profit maximizing condition of the firm
if MR = MC

(b) total revenue = $P \cdot q$ = 150 · 20 = 3000 ✱

total cost = TVC + TFC = 2400 + 1200 = 3600 ✱

profit = TR − TC = 3000 − 3600 = −600 ✱

average variable cost = $\frac{TVC}{q}$

TC = 3600

TC = TVC + TFC → TVC = 2400

AVC = $\frac{2400}{20}$ = 120 ✱

✱ ATC = $\frac{TC}{q}$ = 180

TC = 180 × 20 = 3600

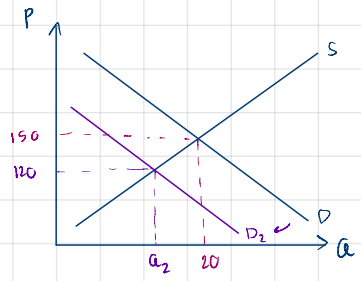
✱ AFC = 60 → $\frac{TFC}{q_{20}}$ = 60

TFC = 1200

(c) from part b. → P > AVC ∴ least loss

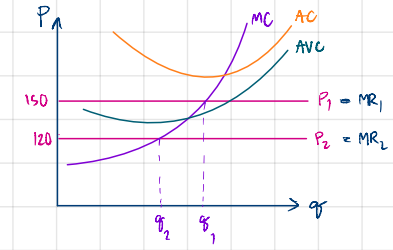
the firm should stay in the market
and choosing between 0 unit and produce up to q^*
it is because firms are expect to recive the profit in the long-run

(d) (i)

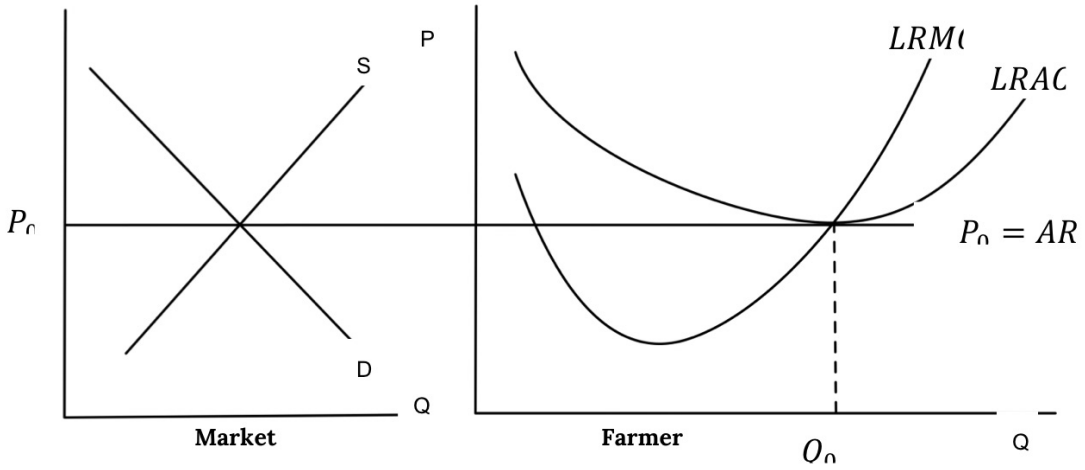


Price decrease to 120
↳ MR drop as well
therefore eqlb. quantity and profit decrease

(ii)



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.



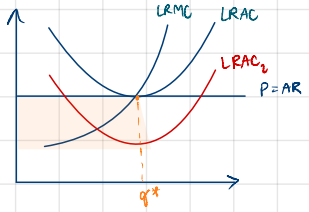
4.a) The government grants a lump sum subsidy to every farmer. How will this change the LRAC? Explain why LRMC does not change.

Ans It can change LRAC b/c it will lower fixed cost
and LRMC doesn't change b/c this curve only tell us how much to produce

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.

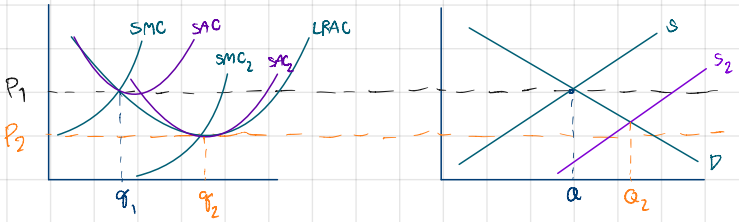
4.c) (10 Points) Demonstrate how this Excess Profit will affect the market price in the Long Run that allows new entry to the market.

(b)



lumpsump subsidy will not change the quantity the farmer want to maximize profit
farmers will earn excess profit after receiving subsidy because subsidy make drop in LRAC which means that the cost is lower while price and quantity are the same.

(c)



in the long run, more firms join this market.
supply curve shift right then we will have new equilibrium price which is lower.

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).

$P = 60 - 0.6Q$

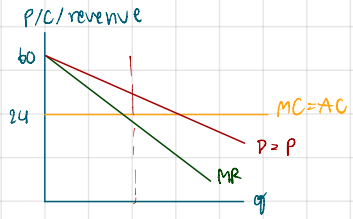
$MC = AC = 24$

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.

(a)



$TR = P(Q) \cdot Q = (60 - 0.6Q)\,Q = 60Q - 0.6Q^2$

$MR = \frac{dTR}{dQ} = 60 - 1.2Q$ ✳

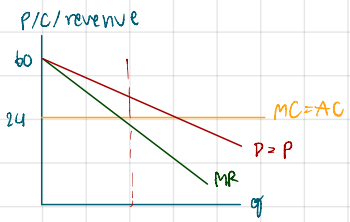
(b) a profit maximizing in monopolist is occur when MR = MC.

optimal unit of house → MR = P

$60 - 0.6Q = 24$

$0.6Q = 36$

$Q = 60$



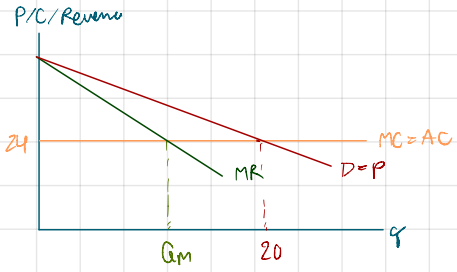
profit is derived from the difference between TR and TC

$TC = AR \cdot q = 24 \times 60 = 1440$

$TC = AC \cdot q = 24 \times 60 = 1440$

$AR = P = 60 - 0.6(60) = 24$

(c)



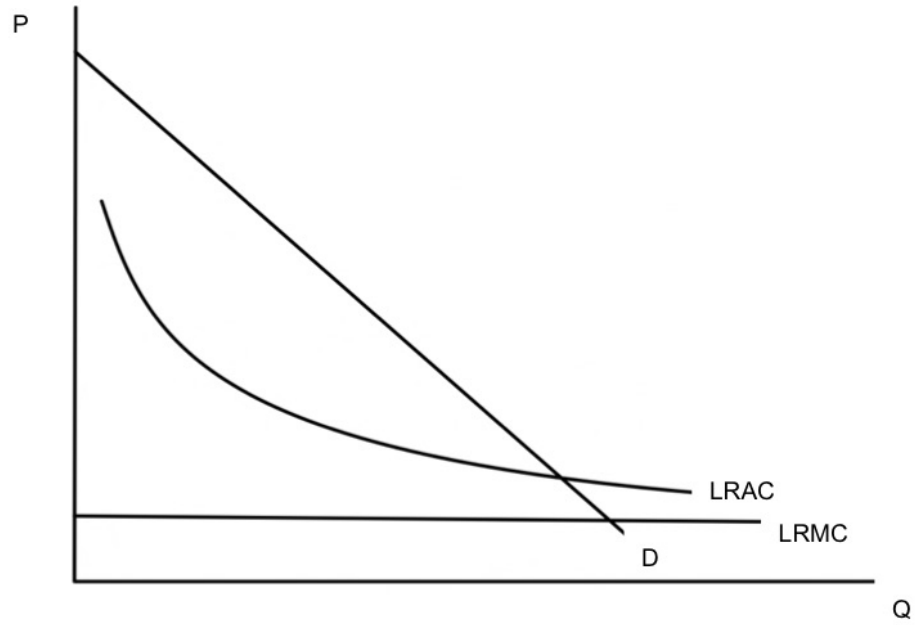
ideal price ; P = MC

$60 - 0.6Q = 24$

$Q = 20$

from this diagram, ideal price after the intervention is the same as the price before intervention

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.



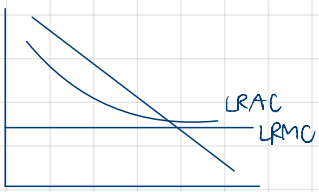
6.a) If the demand of vaccine is downward sloping as usual, show the equilibrium price and quantity that will maximize the profit. State the equilibrium conditions. Identify the profit and the deadweight loss to the society.

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.

(a)

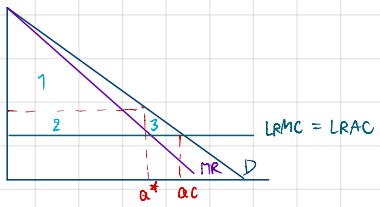


equilibrium : $MC = MR$
profit : $(P_M - P_C) \cdot Q^*$

(b) Lerner's index $= \frac{P-MC}{P} = \frac{50-10}{50} = \frac{4}{5}$

ⓒ ideal price → P = MC → monopoly will not earn any profit at ideal price level
50 ≠ 10 because P is not equal to MC

ⓓ fair price → P=AC



1) consumer surplus
2) seller's profit
3) deadweight loss