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) $|MRTS_{LK}| = \frac{MP_L}{MP_K} = \frac{6}{8} = 0.75$

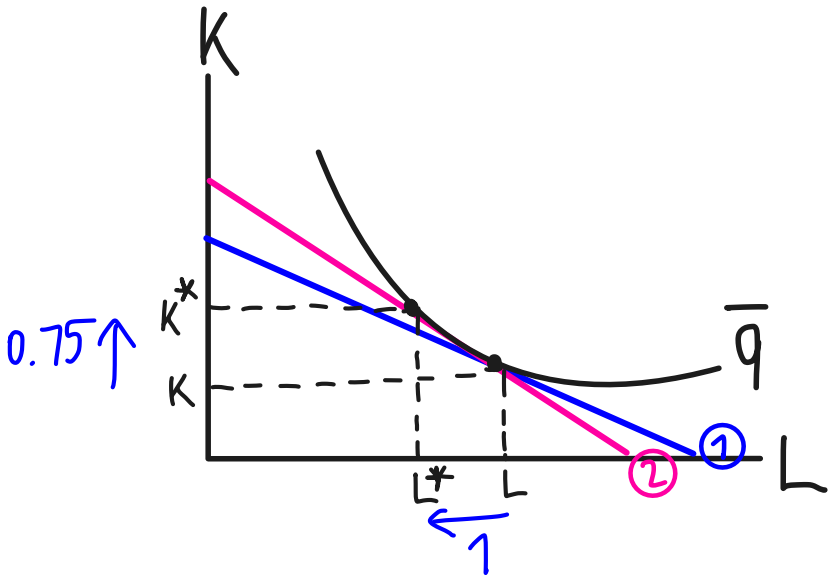
The firm can sacrifice 0.75 units of k to gain 1 unit of labour.

$\frac{MPL}{w} = \frac{MPk}{r}$: $r = \frac{MP_k \times w}{MP_L} = \frac{8 \times 3}{6} = 4$

1.b) Slope of isocost $= -\frac{w}{r}$

$m_1 = -\frac{3}{4} = -0.75$ $m_2 = -\frac{4}{4} = -1$

Slope of isoquant = MRTS = −0.75



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.

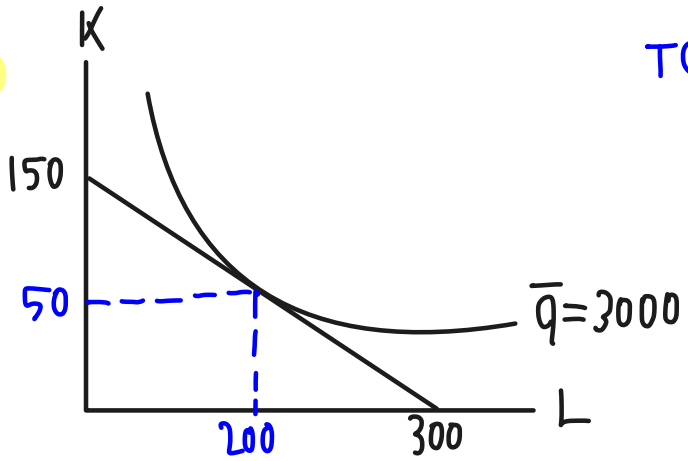
2.a) Draw a diagram to illustrate this firm's cost-minimization decision, where L is on the x-axis and K is on the y-axis. Also, explain the firm's cost-minimization conditions.

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.

2.a)



$TC = 10L + 20K \rightarrow 3{,}000 = 10L + 20K$

assume $L=0$; $3000 = 20K$, $K = 150$

$K=0$; $3000 = 10L$, $L = 300$

$TC = wL + rK$

$= 10(200) + 20(50) = 3{,}000$

Slope of isoquant

$MRTS_{LK} = \frac{MP_L}{MP_K} = \frac{4}{8} = 0.5$

$\frac{MP_L}{w} = \frac{MP_K}{r}$

$MP_L = \frac{8}{20} \times 10 = 4$

The firm can give up 0.5 units of K to gain 1 unit of L.

2.b) $\frac{MP_L}{w} = \frac{MP_K}{r}$

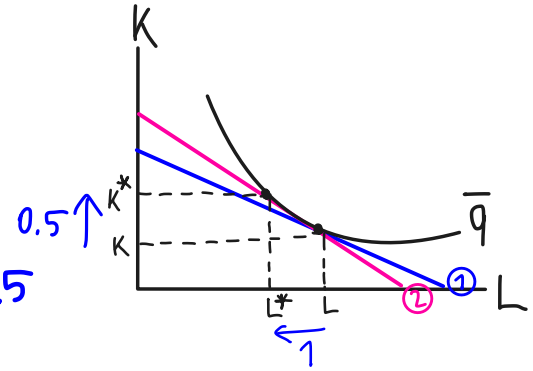
$MP_L = \frac{8}{20} \times 10$

$= 4$

2.c) Slope of isocost $= -\frac{w}{r}$

$m_1 = \frac{-10}{20} = -0.5$, $m_2 = \frac{-15}{20} = -0.75$

Slope of isoquant = MRTS = -0.5



2.d) In short-run production, at least one of the factors is fixed. There is no change in scale of production.
In long-run production, it uses fluctuating variables, so there is change in scale of production.

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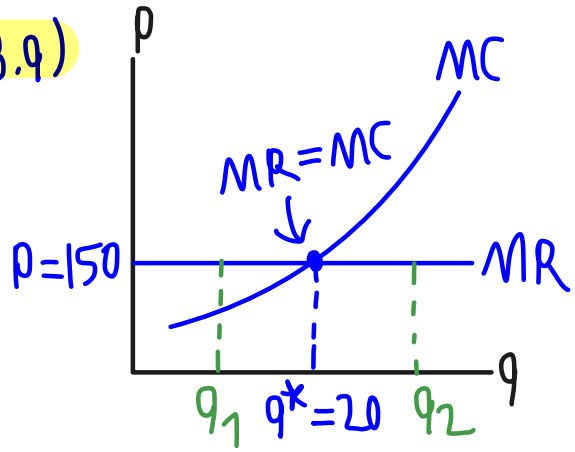
3. Consider a perfectly competitive market, in which the current equilibrium price is 150 baht per unit.

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.a)



Equilibrium quantity is determined by choosing the point where MR=MC, it is also a profit maximizing point

At q_1 : MR > MC
q_2 : MR < MC

3.b)

AVC = ATC − AFC = 180 − 60 = 120
TR = P·Q = 150 × 20 = 3,000
TC = TFC + TVC = 1,200 + 3,600 = 4,800
Profit = TR − TC = 3,000 − 4,800 = −1,800 (Loss)

3.c) The firm incurs an economic loss, because the price is greater than AVC but less than ATC. However, it can keep staying in the market and maximize profit by producing quantity of the output that equates MR & MC. The loss from production is less than from <u>not</u> producing.

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?

3.d) if $p=120$

$TR = p.q = 120 \times 20 = 2,400$

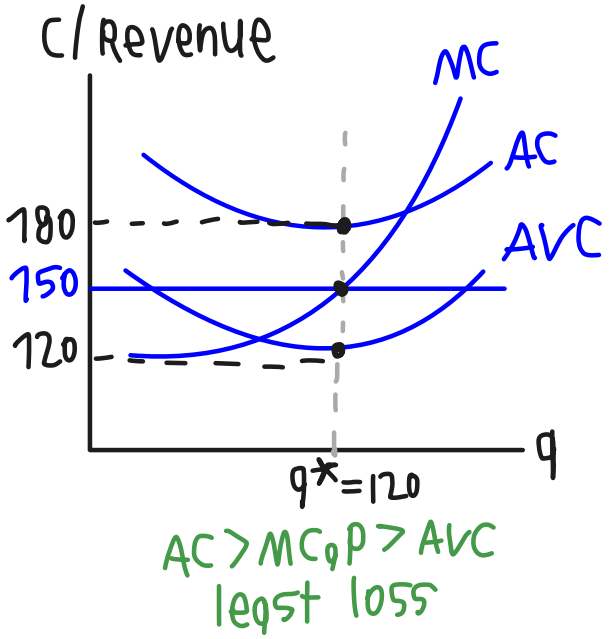
$TC = 4,800$

$\pi = 2,400 - 4,800 = -2,400$ (Loss)

$AV = AFC + AVC$

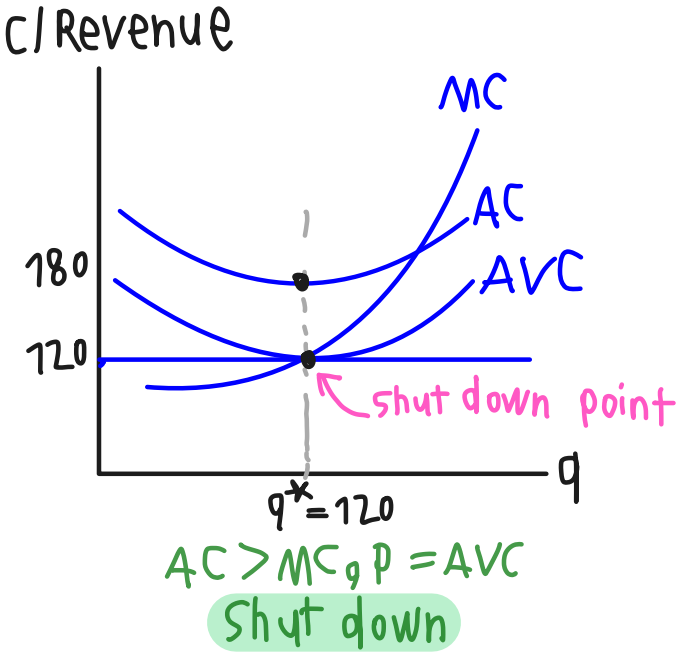
$= 60 + 120$

$= 180$



AC > MC, p > AVC

least loss

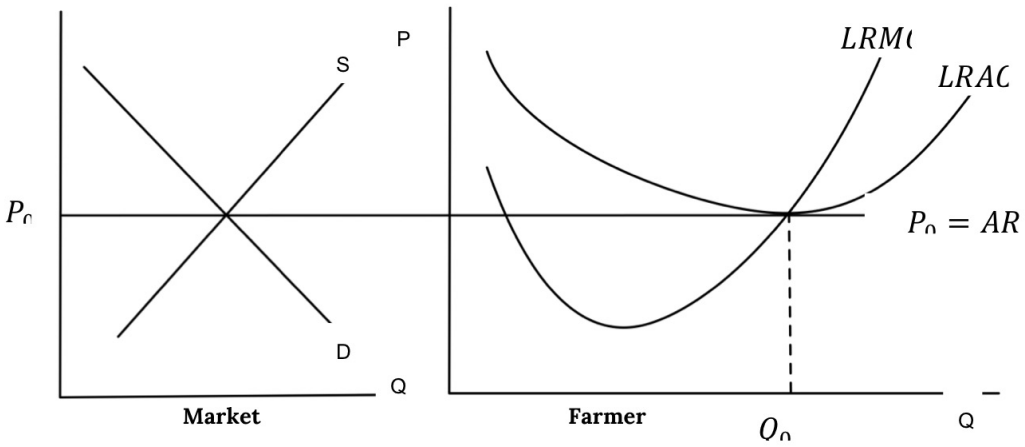


AC > MC, p = AVC

Shut down

The change of the price directly affects profit of the firm. At this point, the firm should consider producing at zero unit or shut down because if the firm keeps producing at q^*, it is likely to meet higher loss since there is no part of the revenue that can be used for fixed cost.

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.

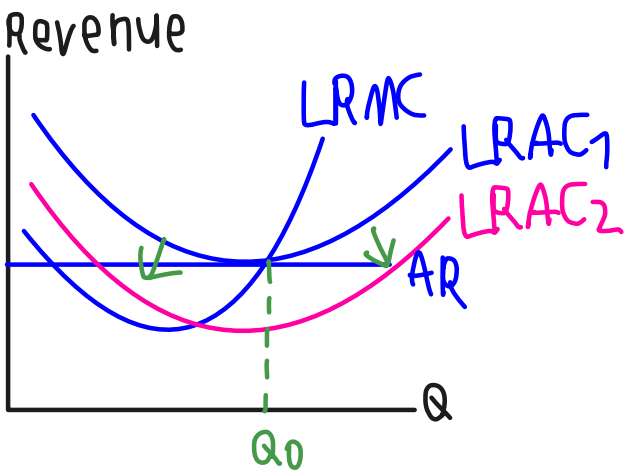


4.a) The government grants a lump sum subsidy to every farmer. How will this change the LRAC? Explain why LRMC does not change.

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.

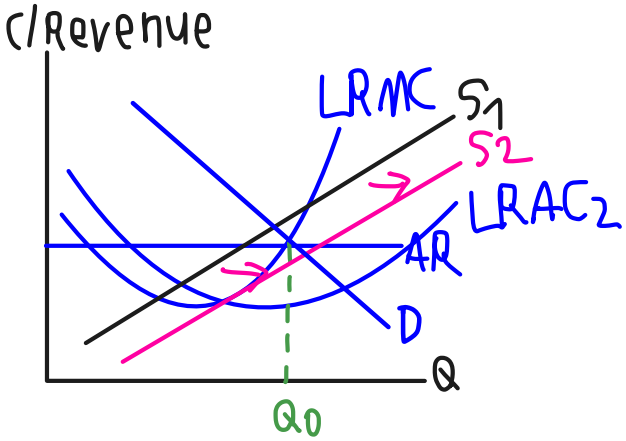
4.c) (10 Points) Demonstrate how this Excess Profit will affect the market price in the Long Run that allows new entry to the market.

4.a)



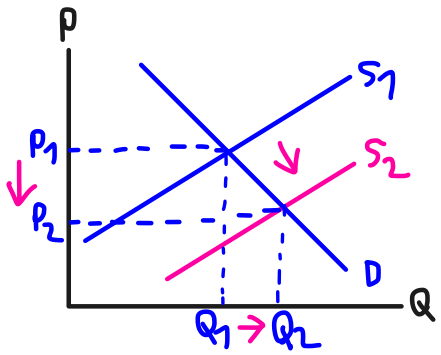
Lump-sum subsidy lowers fixed costs and makes ATC decreases at each unit of quantity. This causes LRAC to shift downward. But the LRMC doesn't change because the firm won't change the level of output.

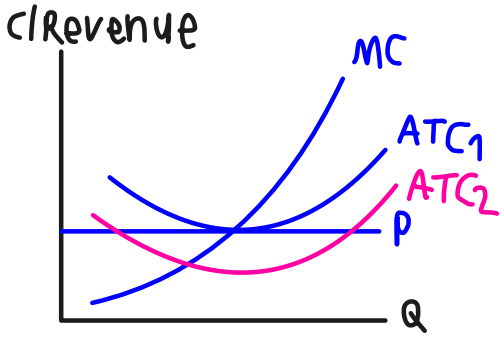
4.b)



The subsidy reduces the average cost for the firm, this creates profits and attracts new farmers to enter market in short-run period. This will shift market supply curve to the right.

4.c)





Profits in the rice market attract entry in the long run. As more farmers enter, the supply curve shifts rightward and the price falls. New farmers will enter as long as price exceed ATC curve. Even though the output of individual farmer falls, there are now more farmers causing output of rice rises to Q_2.

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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).

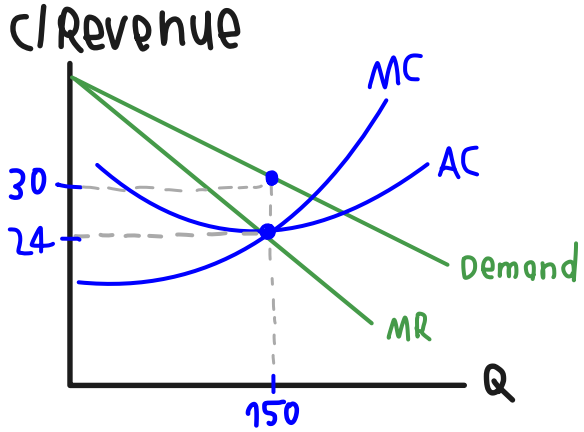
P = 60 − 0.6Q

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.a)



$P = 60 - 0.6Q$

$TR = P \times Q$

$= (60 - 0.6Q) \times Q$

$= 60Q - 0.6Q^2$

$MR = \frac{dTR}{dQ}$

$= 6 - 0.12Q$

$MC = 24 = MR = 6 - 0.12Q$

$\therefore Q^* = 150$, $P = 30$

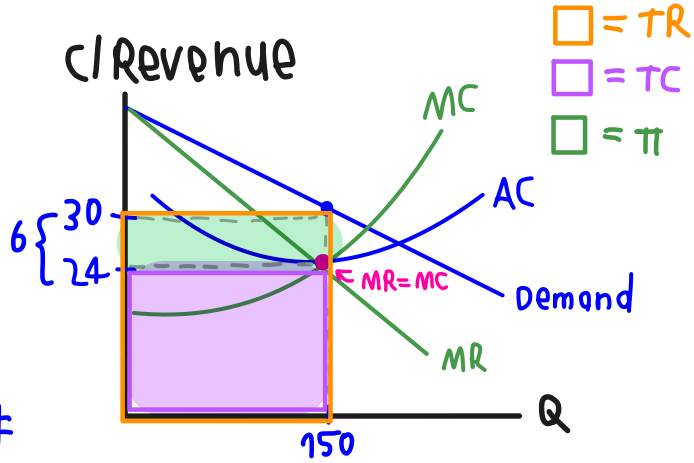
5.b) The condition of profit maximization is MR = MC

The optimal units of houses is 150

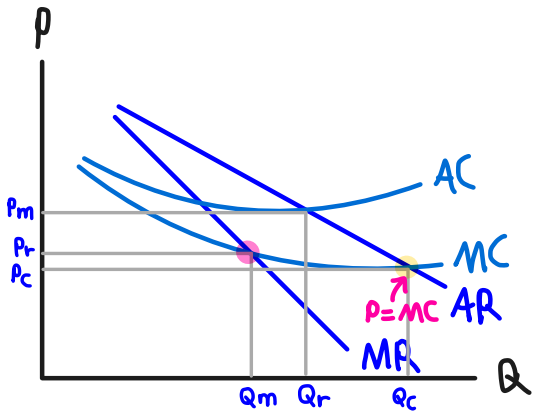
Profit = TR − TC

= 30(150) − 24(150)

= 6(150) = 900 million baht #



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.



Because average cost is declining, MC is always below average cost. Before the intervention, HL would produce at Q_m and sell at p_m. Ideal price is push down to P=MC. However, it doesn't cover AC, so the firm must set the price at P_r where AC and AR intersect. Finally, there's no profit but outputs is larger.

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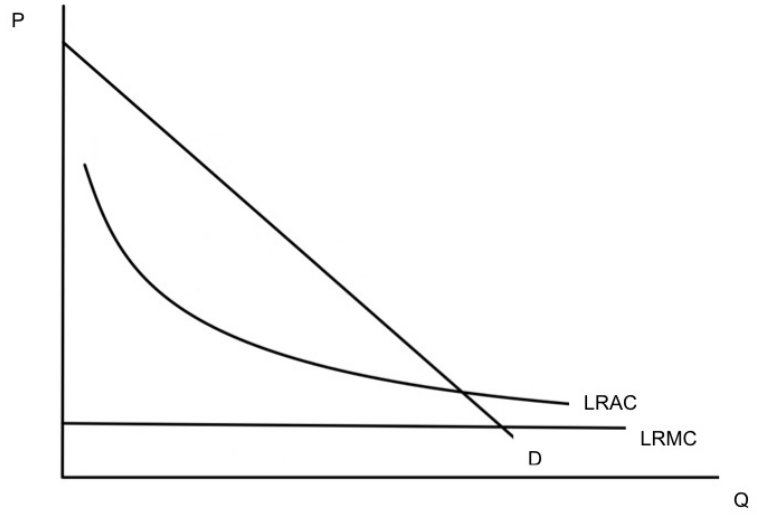
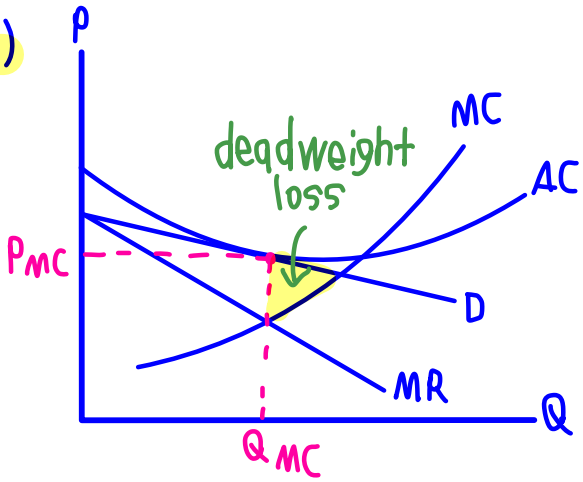
6. The producer of the upcoming vaccine for COVID-19 is a monopoly who wants to price their vaccine to maximize profit. The cost of producing the vaccine is mostly fixed cost involving the research so that the Long Run Average Cost (LRAC) keeps declining the more vaccine is produced. The Long Run Marginal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



In monopolistic competition the equilibrium price exceeds marginal cost. If output were expanded to the point where demand curve intersects MC curve, total surplus will be increased creating deadweight loss.

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.

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

6.c) Earning profit from setting ideal price sometimes doesn't occurs because it depends on the price set. If ideal price is below averge cost, there's no profit and the monopolist have to leave the market.

6.d) There's no deadweight loss because the monopolist will definitely end up getting at least normal profit from setting the Fair price.