# Exercise 7

**1.** P= 11-Q

AC =6

So, TC= AC(Q) = 6Q

MC= $\frac{dTC}{dQ} = 6$

R=PQ=11Q-$Q^2$

MR= $\frac{dTR}{dQ}$ =11-2Q

At profit maximization MR=MC

11-2Q=6

Q=2.5

Price maximizing profit; P=11-2.5=8.5

Profit = TR-TC = 11(2.5)-$2.5^2$-6(2.5)

=6.25

**2.** given MC=25, $\frac{dQ}{dP}\frac{P}{Q}$ =-3

Use lerner index to determine price

L $\frac{P-MC}{P} = \frac{-1}{E_d}$

$\frac{P-25}{P} = \frac{-1}{-3}$

$P - 25 = \frac{1}{3}P$ So, P = 37.5

**3.** given TC=$Q^2$+10Q, $Q_1$=32-0.4$P_1$ and $Q_2$=18-0.1$P_2$

This is considered to be third degree price discrimination, separated in two markets

So, TC =$(Q_1+Q_2)^2$+ 10($Q_1$+$Q_2$) ; Find profit maximizing level of each market

Profit function $\pi = (80 - 25Q_1)Q_1 + (180 - 10Q_2)Q_2 - ((Q_1 + Q_2)]^2 + 10(Q_1 + Q_2))$

$\frac{d\pi}{dQ_1}$ = 80-5$Q_1$-2($Q_1$+$Q_2$)-10=0

70=7$Q_1$+2$Q_2$

$\frac{d\pi}{dQ_1}$ = 180-2$Q_2$-2($Q_1$+$Q_2$)-10=0

170=22$Q_2$+2$Q_1$

Compute $Q_1$ and $Q_2$ using above 2 equations we get $Q_1$=8 $Q_2$=7

Substitute in each of demand we get $P_1$= 60, $P_2$=110
Profit = 850

If can't use third degree , combine demand
$Q_1+Q_2$= 32-0.4P+18-0.1P
Q=50-0.5P
Find marginal cost = 2Q+10
Max profit MR= MC

Q=15
P=70
Profit = 675

**4** . given D=1800-200P, LAC =1.5 baht = LMC

For perfect competition price will be sold at LAC
P=MC
200P=1800-Q
P=9- $\frac{1}{200}$Q =1.5
7.5=$\frac{1}{200}$Q
Q=1500
P=1.5 baht
Profit = 0, consumer surplus = $\frac{1}{2} x (9-1.5) x 1500$ =5625

For Simple Monopoly

MR=MC at profit maximization
MR=9- $\frac{1}{100}$Q =1.5

MR=MC =1.5
7.5=$\frac{1}{100}$Q
Q=750 , P = 5.25
Profit = (5.25-1.5) x 750 =2812.5
Consumer surplus = $\frac{1}{2} x (9-5.25) x 750$ = 1406.25

First degree price discrimination

Could use intregation to calculate first degree discrimination or finding area under the curve.

$$\int_0^{1500} \left(9 - \frac{1}{200}Q\right) - 1.5$$

Or finding area = $\frac{1}{2} x (9 - 1.5) x 1500$
=5625 on producer surplus ,equal to profit, no consumer surplus

**Exercise 8 Monopolistic Competition**

Chamberlin Model

1. Firm think that they could change the price to influence on quantity ( elastic demand) however, if one firm changes the price, other firm changes (assumption of the model) So, market demand curve is relatively steeper than firm demand curve
   In the long run, suppose firm make profit there will be some entry and proportional demand curve shift to the left create overestimation then perceive demand curve has to adjust then it will adjust until every firm make zero profit
   (diagram is a must!!)

2. In the long run, suppose firm make loss there will be some exit and proportional demand curve shift to the right create underestimation then perceive demand curve has to adjust then it will adjust until every firm make zero profit
3. No, it does not bring the same economic efficiency as perfect competitive market. Because price isn't at lowest AC , resulted in creating DWL

4. Given, $P=55-8Q$, $LAC=Q^2-8Q+46$

   In Long run $LAC = D_p$

   $55-8Q=Q^2-8Q+46$

   $Q=3$

   Price = $55-8(3) = 31$

   Slope of perceive demand curve

   Need to find 2 points of perceive demand curve in order to find slope
   One point is on $D_p$=LAC, another is on vertical axis

   Find $MR_f$

   Find MC , $LTC= Q^3-8Q^2+46Q$
   $LMC= 3Q^2-16Q+46$
   At $Q=3$ $LMC=MR_f= 3(9)-16(3) +46 =25$

   $MR_f$ and $D_f$ shared the same point at Y axis, which will be (0, A)

   Moreover, $D_f$ has half the slope of $MR_f$

On $D_f$ we have two points; (31,3) and (0,A)
On $MR_f$ we have two points (25,3)

Slope of $MR_f$=2 x Slope of $D_f$,

$$\frac{25-A}{3}=2\frac{31-A}{3}$$

A=37

Slope of $MR_f$ = -4

$MR_f$ at equilibrium = 25

**Exercise 9 Oligopoly**

**1.** Given $C_L=0.01Q_L^2+3QL$;$Cs=0.01\ Q_S^2+3Q_S$

Market demand; Q=5250-250P

1) Find $\sum MC_S$, ,

   $MC_S= 0.02Q_S+3$

   $Q_S=50\ P\ -150$

   $\sum Q_S$ $=5Q_S=250P\ -750$

2) Find large firm Demand curve
   = Q market- Q small firm
   = (5250-250P)-(250P-75)
   =6000-500P
   P=12-0.002$Q_L$
   MR=12-0.004 $Q_L$

3) $MR_L=MC_L$
   $12-0.004Q_L=0.002Q_L+3$
   $Q_L=1500$

   P =12-0.002(1500)
   =9

4) $\sum Q_S$ = 250(9)-750
   =1500 $Q_s$= 300

**2.** $MC_1=2$ $MC_2=4$ $P=24-2Q$

Find P, Q, profit of Cournot

Firm 1 $TR=P \times Q_1$
$= (24-2(Q_1+Q_2)(Q_1)$
$TR=24Q_1-2Q_1^2-2Q_1Q_2$
$MR= 24-4Q_1-2Q_2$
At profit max $MR_1=MC_1$
$24-4Q_1-2Q_2=2$
$22-2Q_2=4Q_1$
$Q_1=5.5-0.5Q_2$. Reaction curve of Firm1

Firm 2 $TR=P \times Q_2$
$= (24-2(Q_1+Q_2)(Q_2)$
$TR=24Q_2-2Q_2^2-2Q_1Q_2$
$MR= 24-4Q_2-2Q_1$
At profit max $MR_2=MC_2$
$24-4Q_1-2Q_2=4$
$Q_1=10-2Q_2$ Reaction curve of Firm2

Solve equation
$5.5-0.5Q_2=10-2Q_2$
$Q_2=3$ $Q_1=4$
$P=10$
Profit for firm 1 $=10(4)-2(4)=32$
2= $10(3)-4(3)=18$

2.2 Find Stackelberg firm1 move first
$TR_1=24Q_1-2Q_1^2-2Q_1(5-0.5Q_1)$ putting firm 2 reaction curve , as firm 1 care about firm 2 decision

$MR_1=24-4Q_1-10+2Q_1$

$MR_1=14-2Q_1$

$MR_1=MC_1$

$Q_1=6$ , then solve; $Q_2=2$

$P=8$

Profit firm 1 = 36 ; profit firm2 =8

2.3 Find Stackelberg firm2 move first
$TR=24Q_2-2Q_2^2-2Q_2(5.5-0.5Q_2)$ putting firm 1 reaction curve , as firm 2 care about firm 1 decision

$MR_2=13-2Q_2$

$MR_2=MC_2$

$Q_2=4.5$ , then solve; $Q_1=3.25$

P=8.5

Profit firm 1 = 21.125; profit firm2 = 20.25

2.4 If Both firm try to lead

Both firm will choose quantity that they leads

$Q_1=6$, $Q_2=4.5$
P=24-2(6+4.5)
P=3

Profit firm 1 = 6 ; profit firm2 =-4.5

B)

Pay off Matrix

| | Firm2 | | |
|---|---|---|---|
| Firm1 | | Lead | Not lead |
| | Lead | 6,-4.5 | 36,8 |
| | Not Lead | 21.125,20.25 | 32,18 |

C) No dominant strategy Nash Equilibrium is at where Firm 1 lead and Firm 2 not lead.

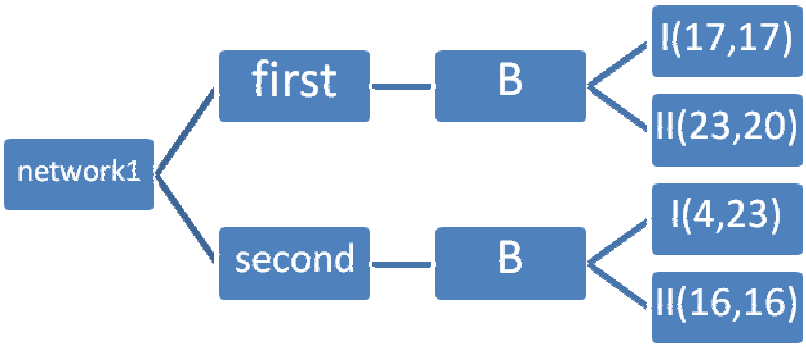
**Exercise 10 Oligopoly part 2**

a) Network 1 have dominant strategy to put bigger show first, while network2 have no dominant strategy. Therefore, network1 choose to play it first, then firm 2 will choose to play second.
b) Maximin, choose min of their choice, then max

Network1 >> play first (17,23) choose 17 as min
>> play second (4,16) choose 4 as min

Then compare $\begin{pmatrix}17\\4\end{pmatrix}$ choose 17 as prevent minimum (4) as possible

c)




If network 1 choose to play bigger one first, B will choose to play second
If network 1 choose to play bigger one second, B will chose to play first

So, network 1 choose to play bigger one first , as getting more value of 23.

**Exercise 11Factor Markets**

3)

| L | AFC | TP | TFC(AFC x L) | MFC | MPL | VMPL |
|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1 | 60 | 10 | 60 | 60 | 10 | 450 |
| 2 | 80 | 18 | 160 | 100 | 8 | 360 |
| 3 | 100 | 24 | 300 | 140 | 6 | 270 |
| 4 | 120 | 28 | 480 | 180 | 4 | 180 |
| 5 | 140 | 30 | 700 | 220 | 2 | 90 |

According to the table , profit maximizing level of employment equal to 4 person, as VMPL = MFC under PC/M/PC

b. size of exploitation = (VMPL-W) *QL
= monopsonistic exploitation =(180-120) x 4 =240

c.depend on objective of labor union and bargaining power of firm and union
1) Max profit for union
2) Max number of labor
3) Max wage bill

**4.)** find wage rate

Given $Q=-L^3+30L^2+292L$ ; price =27 L = 18 elasticity of supply of labor = 2= $\frac{dL}{dW}\frac{W}{L}$
At profit maximization VMPL=MFCL

**5.)** at equilibrium LD =LS

9-0.5W=-6+2W

W= 6

L =6

Find labor demand and supply which w =7

LD = 9-0.5(7) = 5.5

LS=-6+2(7) = 8

New equilibrium at w=7, L=5.5 create excess supply of 2.5= unemployment

The optimal level of minimum wage =6, or do not have, only incase that firm is both monopoly and monopsony that minimum wage will provide better social result