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EE311 Microeconomics Theory, Semester 2/2019

Homework Assignment #8 | Due date: Monday 27 April 2020
(in-class submission, before lecture begins!)

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

Oligopoly (CH 13)

8. A homogeneous products duopoly faces a market demand function given by $P = 300 - 3Q$, where $Q = Q_1 + Q_2$. Both firms have a constant marginal cost $MC = 100$.

a) What is Firm 1's profit-maximizing quantity, given that Firm 2 produces an output of 50 units per year? What is Firm 1's profit-maximizing quantity when Firm 2 produces 20 units per year?
b) Derive the equation of each firm's reaction curve and then graph these curves.
c) What is the Cournot equilibrium quantity per firm and price in this market?
d) What would the price in this market be if it were perfectly competitive?
e) What would the equilibrium price in this market be if the two firms colluded to set the monopoly price?
f) What is the Bertrand equilibrium price in this market?
(Hint: This is the case of Bertrand Duopoly with Homogeneous Product.)
g) What are the Cournot equilibrium quantities and industry price when one firm has a marginal cost of 100 but the other firm has a marginal cost of 90?

h) Assuming that Firm 1 is the Stackelberg leader, find the Stackelberg equilibrium quantities for each firm and the market price.

18. Suppose that the industry consists of a dominant firm, Braeutigam Cobalt (BC), which has a constant marginal cost equal to $40 per unit. The market demand for cobalt is given by Q = 200 – P. There are 9 fringe producers, each of whom has a marginal cost curve MC = 40 + 10q, where q is the output of a typical fringe producer. Assume there are no fixed costs for any producer.

a) What is the supply curve of the competitive fringe?
b) What is BC's residual demand curve?
c) Find BC's profit-maximizing output and price. What is BC's market share? **(Hint: Market Share of a firm = (Q of the firm) / (Total Q in the market).)**

24. RyanAir and EasyJet both fly between London and Marrakech. Their demand curves for EasyJet and RyanAir are given, respectively, by $Q_E = 500 - 2P_E + P_R$ and $Q_R = 500 - 2P_R + P_E$. Q_E and Q_R stand for the number of passengers per day for EasyJet and RyanAir, respectively. The marginal cost of each carrier is £10 per passenger.

a) If EasyJet sets a price of £100, what is the equation of RyanAir's demand curve and marginal revenue curve? What is RyanAir's profit-maximizing price when Easyjet sets a price of £100?
b) Derive the equations for EasyJet's and RyanAir's price reaction curves.
c) What is the Bertrand equilibrium in this market?

Monopsony (CH 10)

26. A coal mine operates with a production function Q = L/2, where L is the quantity of labor it employs and Q is total output. The firm is a price taker in the output market, where the price is currently 32. The firm is a monopsonist in the labor market, where the supply (AFC) curve for labor is w = 4L.

a) What is the monopsonist's MFC?
b) Calculate the monopsonist's optimal quantity of labor. What wage rate must the monopsonist pay to attract this quantity of labor?
c) What would be the w* and L* if the factor market were competitive?

8a. $P = 300 - 3Q_1 - 3Q_2 \qquad Q_2 = 50$

$P = 300 - 3Q_1 - 3(50) \quad \therefore \quad P = 150 - 3Q_1$

$MR = MC \quad \therefore \quad 150 - 6Q_1 = 100$

$Q_1 = 8.33$

$Q_2 = 20, \quad P = 240 - 3Q_1, \quad MR = MC$

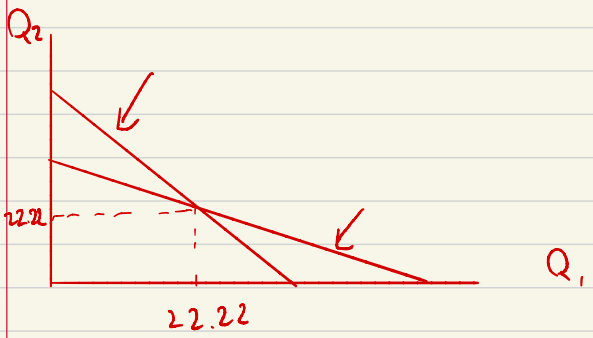
$240 - 6Q_1 = 100$

$Q_1 = 23.33$

b. Firm 1 $P = (300 - 3Q_2) - 3Q_1$

$MR = MC$

$(300 - 3Q_2) - 6Q_1 = 100 \quad \therefore \quad Q_1 = 33.33 - 0.5Q_2$



c. $Q_1 = Q_2$

$Q_2 = 33.33 - 0.5Q_2$

$Q_2 = 22.22$

$P = 300 - 3(44.44) = 166.67$

d. Perfectly competitive: $P = MC = 100$

e. Monopoly price: $300 - 6Q = 100$

$Q = 33.33$

$P = 300 - 3\left(\frac{200}{6}\right) = 200$

f. Bertrand oligopolists, $P = 100$

g. Firm 1 $MC = 100$ $P = (300 - 3Q_2) - 3Q_1$

Firm 2 $MC = 90$ $P = (300 - 3Q_1) - 3Q_2$

Firm 1 $MR = MC$:

$(300 - 3Q_2) - 6Q_1 = 100$

$Q_1 = 33.33 - 0.5Q_2$

Firm 2 $MR = MC$:

$(300 - 3Q_1) - 6Q_2 = 90$

$Q_2 = 35 - 0.5Q_1$

$Q_1 = 21.11$ $Q_2 = 24.44$ $\therefore P = 163.36$

h. Firm 1 leads $\therefore$ Firm 2 $Q_2 = 33.33 - 0.5Q_1$

Firm 1 then $MC = MR$

$TR_1 = PQ_1 = (300 - 3Q_1 - 100 + 1.5Q_1)Q_1$

$= (200 - 1.5Q_1)Q_1$

$MR_1 = 200 - 3Q_1$

$MR_1 = MC \therefore 200 - 3Q_1 = 100$

$Q_1 = 33.33$

$Q_2 = 33.33 - 0.5(33.33) = 0.5(33.33)$

18. $MC = 40 + 10q \qquad q = 0.1P - 4$

$$S_F = \begin{cases} 0 & P \leq 40 \\ 0.9P - 36 & P > 40 \end{cases}$$

b. Residual demand:

$$Q_R = \begin{cases} 200 - P & P \leq 40 \\ 236 - 1.9P & P > 40 \end{cases}$$

c. Residual demand curve: $P = \left(\frac{10}{19}\right)(236 - Q_R)$

$MR = \left(\frac{10}{19}\right)(236 - 2Q_R)$

$MR = MC$

$MR = 40$

$\left(\frac{10}{19}\right)(236 - 2Q_R) = 40$

$Q_R = 80$

$P = \left(\frac{10}{19}\right)(236 - 80)$

$P = 82.11$

$Q = 200 - 82.11 = 117.89$

Market share: $\frac{80}{117.89} = 0.68 = 68\%$

24c. $P_{Easy\,Jet} = 100$

$Q_R = 500 - 2P_R + 100$
$P_R = 300 - 0.5Q_R$

$MR = MC$

$MR_R = 300 - Q_R$
$300 - Q_R = 10$
$Q_R = 290$
$P_R = 155$

b. $MR_E = MC_E = 10$

$Q_E = 500 - 2P_E + P_R$
$P_E = 250 - 0.5Q_E + 0.5P_R$

$TR_E = P_E Q_E = (250 - 0.5Q_E + 0.5P_R)Q_E$
$MR_E = 250 - Q_E + 0.5P_R$

$MR_E = MC_E = 10$
$250 - Q_E + 0.5P_R = 10$
$Q_E = 240 + 0.5P_R$

$Q_E = 500 - 2P_E + P_R$
$500 - 2P_E + P_R = 240 + 0.5P_R$
$260 + 0.5P_R = 2P_E$
$BR_E: P_E = 130 + 0.25P_R$

$BR_R : P_R = 130 + 0.25 P_E$

c. Bertrand equilibrium:

$P_E = 130 + 0.25 (130 + 0.25 P_E)$

$P_E = P_R = 185.71$

26a. Monopsonist:

$$ME_L = w + L \frac{\Delta w}{\Delta L}$$

$ME_L = 4L + L(4)$

$ME_L = 8L$

b. Profit max Monopsonist: $MRP_L = ME_L$, $MRP_L = P \frac{\Delta Q}{\Delta L}$

$\frac{\Delta Q}{\Delta L} = 0.5 \therefore MRP_L = 0.5P$

$P = 32$, $MRP_L = 16 \therefore 16 = 8L \therefore L = 2$

Q Labour $= w = 4L = 8$

c. Competitive labour market: $w = MRP_L$

Supply of Labour: $L = 4$

$w = 4L = 16$