

# Homework

Due 24 January

- 1 Suppose the demand curve is  $Q(p) = p^\epsilon$ , what is the elasticity of demand? If marginal cost is \$1 and  $\epsilon = -2$ , what is the profit-maximizing price?
- 2 Suppose the demand curve for corn is  $Q(p) = 10 - p$ . Suppose that one firm owns all five units of corn in the world and has zero marginal cost. Does a monopoly sell less output than would be sold in a competitive market in which 100 firms each own 0.05 units?
- 3 Problem 8, Chapter 13 in Church and Ware (2000) (Church and Ware (2000) is an e-book and is available online).
- 4 (write about 0.5 page) Find 1 example of an industry that has a dominant firm. Describe what this industry is, which firm is the dominant firm, which firms are fringe firms (name the ones that you

$$1. \quad Q(P) = P^\varepsilon$$

$$\frac{dQ}{dP} = \varepsilon P^{\varepsilon-1}$$

$$\frac{dQ}{dP} \cdot \frac{P}{Q} = \varepsilon P^{\varepsilon-1} \cdot \frac{P}{P^\varepsilon}$$

$$\frac{dQ}{dP} \cdot \frac{P}{Q} = \varepsilon P^{\varepsilon-1} \times P^{1-\varepsilon}$$

$$= \varepsilon$$

$\therefore$  Elasticity of demand is  $\varepsilon$

$$\text{from } Q(P) = P^\varepsilon$$

$$P = Q^{\frac{1}{\varepsilon}}$$

$$TR = P \times Q$$

$$= Q^{\frac{1}{\varepsilon} + 1}$$

$$MR = \left(\frac{1}{\varepsilon} + 1\right) Q^{\frac{1}{\varepsilon}}$$

profit maximize condition

$$MC = MR$$

$$1 = \left(\frac{1}{\varepsilon} + 1\right) Q^{\frac{1}{\varepsilon}}$$

$$\frac{1}{\frac{1}{\varepsilon} + 1} = Q^{\frac{1}{\varepsilon}}$$

$$2 = Q^{\frac{1}{2}}$$

$$\frac{1}{4} = Q$$

$$\frac{dQ}{dP} \cdot \frac{P}{Q} = \varepsilon = \frac{Q^{1/\varepsilon}}{Q}$$

$$\frac{dQ}{dP} \cdot \frac{P}{Q} = -2 \times \frac{2}{1/4}$$

$$\frac{dQ}{dP} \cdot \frac{P}{Q} = -16 \quad \text{Maximize condition}$$

$$Q = 10 - P$$

$$P = 10 - Q$$

$\therefore$  Maximizing price is  $P = 10 - Q$

2. profit maximize condition

$$MC = MR$$

$$TR = 10Q - Q^2$$

$$MR = 10 - 2Q$$

$$10 - 2Q = 0$$

$$10 = 2Q$$

$$Q = 5$$

Output sold by each competitive firm = 0.05

Total number of firms = 100

Total output sold by a competitive firm =  $0.05 \times 100 = 5$

No, the monopoly sells same output levels as the competitive market.

8. Output is homogenous and the demand curve is

$$P = 448 - Q.$$

There are two firms with identical costs given by  $C = q_i^2$  where  $q_i$  is the production of firm  $i$ .  
The marginal cost of firm  $i$  is  $MC_i(q_i) = 2q_i$ .

- (a) Find the Cournot equilibrium firm outputs.  
(b) Find the Stackelberg equilibrium firm outputs.

### a) find the cournot equilibrium firm outputs

The market output ( $Q$ ) come from two firms.

$$Q = (Q_1 + Q_2)$$

plug in two outputs

$$P = 448 - (Q_1 + Q_2)$$

$$ap = 448 - Q_1 - Q_2$$

Find total revenue firm one

$$TR_1 = P \cdot Q_1 = (448 - Q_1 - Q_2)Q_1$$

$$TR_1 = 448Q_1 - Q_1^2 - Q_1Q_2$$

$$MR_1 = 448 - 2Q_1 - Q_2$$

profit maximize condition

$$MR_1 = MC_1$$

$$448 - 2Q_1 - Q_2 = 2Q_1$$

$$448 - Q_2 = 4Q_1$$

$$Q_1 = 112 - 0.25Q_2 \quad \textcircled{1}$$

Find total revenue firm two

$$TR_2 = P \cdot Q_2 = (448 - Q_1 - Q_2)Q_2$$

$$TR_2 = 448Q_2 - Q_1Q_2 - Q_2^2$$

profit maximize condition

$$MR_2 = MC_2$$

$$448 - Q_1 - 2Q_2 = 2Q_2$$

$$448 - Q_1 = 4Q_2$$

$$Q_2 = 112 - 0.25Q_1 \quad \textcircled{2}$$

Solve firm two and firm one reaction functions simultaneously

sub  $\textcircled{2}$  in  $\textcircled{1}$

$$Q_1 = 112 - 0.25(112 - 0.25Q_1)$$

$$Q_1 = 112 - 28 + 0.0625Q_1$$

$$0.9375Q_1 = 84$$

$$Q_1 = 89.6 \text{ units}$$

sub  $Q_1 = 9.6$  in  $\textcircled{2}$

$$Q_2 = 112 - 0.25(89.6)$$

$$Q_2 = 112 - 22.4 \text{ units}$$

$$Q_2 = 89.6 \text{ units}$$

$$\therefore Q_1 = Q_2 = 89.6 \text{ units}$$

### b) find the stackelberg equilibrium firm outputs

Assume firm one as leader and firm two as follower

$$Q_1 = 112 - 0.25Q_2$$

$$P = 448 - (112 - 0.25Q_2) - Q_2$$

$$P = 448 - 112 + 0.25Q_2 - Q_2$$

$$P = 336 - 0.75Q_2$$

Find marginal revenue firm two

$$TR_2 = P \cdot Q_2$$

$$TR_2 = (336 - 0.75Q_2)Q_2$$

$$TR_2 = 336Q_2 - 0.75Q_2^2$$

$$MR_2 = 336 - 1.5Q_2$$

profit maximize condition

$$MR_2 = MC_2$$

$$336 - 1.5Q_2 = 2Q_2$$

$$3.5Q_2 = 336$$

$$Q_2 = 96 \text{ units}$$

sub  $Q_2$  back to equation find  $Q_1$

$$Q_1 = 112 - 0.25(96)$$

$$\therefore Q_1 = 88 \text{ units}$$

$$Q_2 = 96 \text{ units}$$

4. CPALL is a dominant firm in retail industry by the Charoen Pokphand group to operate convenience store business in Thailand under the 7-Eleven trademark. The company was granted a license to use the trademark by 7-Eleven. Which outnumber other convenience store or fringe firm in Thailand by having about 12,500 branch in Thailand. In 2002, CPALL made an agreement to cooperate with PTT to open their branch in most of the PTT station in all region in Thailand. Furthermore 7-11 has improve the facility to serve variety range of customer such as having delivery, All-cafe, restaurant, and pharmacy. By acquire Makro and Tesco to become an affiliated company, CPALL can restock some of their good at cheaper price from buying large portion of it. This firm even try to maintain customer satisfaction and regain old customer by creating All-member point reward which customer will gain point after buying good and services to redeem a gift from 7-11. The fringe firm of 7-11 are Lawson-108, Maxvalu, Top, Family mart, and Big C mini which have only a small share in the retail industry in Thailand.