

Homework

- 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?

① $\pi = TR - TC$

$$\pi = [P(Q) \cdot Q] - [TC]$$

$$\frac{\partial \pi}{\partial Q} = \left[P(Q) \cdot \frac{dQ}{dQ} + Q \cdot \frac{dP(Q)}{dQ} \right] - \left[\frac{\partial TC}{\partial Q} \right] = 0$$

$$\left[P(Q) + Q \cdot \frac{dP(Q)}{dQ} \cdot \frac{P(Q)}{P(Q)} \right] - \left[\frac{\partial TC}{\partial Q} \right] = 0$$

$$\left[P(Q) + \frac{dP(Q)}{dQ} \cdot Q \right] \cdot \frac{Q}{P(Q)} \cdot P(Q) - [MC] = 0$$

$$\left[P(Q) + \frac{dP(Q)}{dQ} \cdot Q \right] - [MC] = 0$$

$$\left[P(Q) + \frac{1}{EP} \cdot P(Q) \right] = MC$$

$$P(Q) \left[1 + \frac{1}{EP} \right] = MC$$

$$P(Q) \left[1 - \frac{1}{|EP|} \right] = MC$$

or

$$MR = MC$$

Profit. max. condition

$$Q(P) = P^{-2} \rightarrow P = Q^{-\frac{1}{2}}$$

$$EP = \frac{\partial Q}{\partial P} \cdot \frac{P}{Q}$$

$$EP = [-2P^{-3}] \cdot \frac{P}{P^{-2}}$$

$$EP = -2P^{-4}$$

find $TR = P \cdot Q$

$$TR = (Q^{-\frac{1}{2}}) Q$$

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

find $MR = \frac{\partial TR}{\partial Q}$

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

$$MR = MC$$

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

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

$$Q = 2^{-2}$$

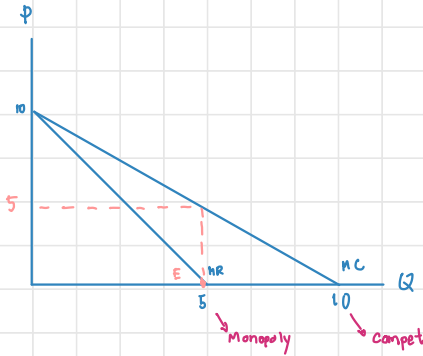
$$Q = \frac{1}{4}$$

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

$$P = \left(\frac{1}{4}\right)^{-\frac{1}{2}}$$

$$P = 2$$

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?



$$TR = P \cdot Q$$

$$TR = (10 - Q) \cdot Q$$

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

$$MR = \frac{\partial TR}{\partial Q}$$

$$MR = 10 - 2Q$$

$$MR = MC \quad \rightarrow \quad P = 10 - Q$$

$$10 - 2Q = 0 \quad \rightarrow \quad P = 10 - 5$$

$$Q = 5 \quad \rightarrow \quad P = 5$$

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.

$$\text{Firm 1: } \pi_1 = TR_1 - TC_1$$

$$\pi_1 = P \cdot q_1 - TC_1$$

$$\pi_1 = [448 - q_1 - q_2] q_1 - (q_1^2)$$

$$\frac{\partial \pi_1}{\partial q_1} = 448 - 2q_1 - q_2 - 2q_1 = 0$$

$$4q_1 = 448 - q_2$$

$$q_1 = \frac{448 - q_2}{4}$$

$$\text{Firm 2: } \pi_2 = TR_2 - TC_2$$

$$\pi_2 = P \cdot q_2 - TC_2$$

$$\pi_2 = [448 - q_1 - q_2] q_2 - (q_2^2)$$

$$\frac{\partial \pi_2}{\partial q_2} = 448 - q_1 - 2q_2 - 2q_2 = 0$$

$$4q_2 = 448 - q_1$$

$$q_2 = \frac{448 - q_1}{4}$$

a) find Cournot equilibrium

$$\text{plug ② into ①} : q_1 = 448 - \frac{448 - q_1}{4}$$

$$4q_1 = 1792 - 448 + q_1$$

$$16q_1 = 1344 + q_1$$

$$15q_1 = 1344$$

$$q_1 = 89.6$$

$$\text{plug } q_1 = 89.6 \text{ into ②}$$

$$q_2 = \frac{448 - 89.6}{4}$$

$$q_2 = 89.6$$

Cournot equilibrium is $(q_1, q_2) = (89.6, 89.6) \#$

b) find Stackelberg equilibrium

Let firm 2 be the leader

$$\pi_2 = TR_2 - TC_2$$

$$\pi_2 = P \cdot q_2 - TC_2$$

$$\pi_2 = [448 - q_1 - q_2] q_2 - q_2^2$$

$$\pi_2 = \left[448 - \left(\frac{448 - q_2}{4} \right) - q_2 \right] q_2 - q_2^2$$

$$\frac{\partial \pi_2}{\partial q_2} = 448 - 112 + \frac{1}{2} q_2 - 2q_2 - 2q_2 = 0$$

$$3.5q_2 = 336$$

$$q_2 = 96$$

$$q_1 = \frac{448 - 96}{4}$$

$$q_1 = 88$$

Let firm 1 be the leader

$$\pi_1 = TR_1 - TC_1$$

$$\pi_1 = P \cdot q_1 - TC_1$$

$$\pi_1 = [448 - q_1 - q_2] q_1 - [q_1^2]$$

$$\pi_1 = \left[448 - q_1 - \left(\frac{448 - q_1}{4} \right) \right] q_1 - q_1^2$$

$$\frac{\partial \pi_1}{\partial q_1} = 448 - 2q_1 - 112 + \frac{1}{2} q_1 - 2q_1 = 0$$

$$q_1 = 96$$

$$\text{plug } q_1 = 96 \text{ into ②} \quad q_2 = 88$$

\therefore leader $\rightarrow q_i = 96$

follower $\rightarrow q_i = 88$

\rightarrow leader advantage

- 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

The industry I choose to talk about is Thai department store and mall, this industry shows that there is dominant firm.

The Shopping mall industry consists of companies that develop, lease, maintain, repair and secure large commercial property in exchange for rental payments from retailers and businesses.

Accordingly, industry revenue primarily fluctuates in line with rental rates and occupancy levels.

According to Asia.nikkei.com, central group takes around 54% of the market share for the mall industry in Thailand, it could be known as the dominant firm in this industry.

Fringe firm such as Esplanade, Future, Siam, Paragon, BigC, etc. take the remained shares.