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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?

$\varepsilon_{q,P} = \frac{\%\Delta Q}{\%\Delta P} = \frac{\Delta Q}{\Delta P} \cdot \frac{P}{Q}$

$Q = P^{-2}$

$\frac{\Delta Q}{\Delta P} = -2P^{-3}$

$\varepsilon_{q,P} = \frac{\Delta Q}{\Delta P} \cdot \frac{P}{Q} = -2P^{-3} \times \frac{P}{P^{-2}} = -2P^{-3} \times P^{1+2} = -2$ Elasticity of demand is -2

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

$TR = PQ = Q^{\frac{-1}{2}} \cdot Q = Q^{\frac{-1}{2}+1} = Q^{\frac{1}{2}}$

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

$Q(P) = P^{-2}$

$\frac{1}{4} = P^{-2}$

$2 = P$

Profit maximization price equal to 2

max profit : MR=MC

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

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

$Q = (2)^{-2} = \frac{1}{4}$

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?

$TR = PQ = (10 - Q)Q = 10Q - Q^2$

$Q = 10 - P$

$P = 10 - Q$

$\frac{dTR}{dQ} = 10 - 2Q$

$MR = MC \rightarrow 5 = Q$

In a competitive market, output sold by each firm 0.05

Total number of firms in the market = 100

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

In conclusion, the monopoly sells same output level as the competitive market

Problem 8, Chapter 13 in Church and Ware (2000) (Church and Ware (2000) is an e-book and is available online).

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) for firm 1 : $\pi_1 = P \times q_1 - TC_1 = (448 - (q_1 + q_2))q_1 - q_1^2$

$= 448q_1 - q_1^2 - q_1q_2 - q_1^2$

$= 448q_1 - 2q_1^2 - q_1q_2$

$\max \pi_1 : \frac{\partial \pi_1}{\partial q_1} = 448 - 4q_1 - q_2$

$q_2 = 448 - 4q_1 = 89.6$

for firm 2 $\pi_2 = P \times q_2 - TC_2 = (448 - (q_1 + q_2))q_2 - q_2^2$

$= 448q_2 - q_1q_2 - q_2^2 - q_2^2$

$= 448q_2 - q_1q_2 - 2q_2^2$

$\max \pi_2 \frac{\partial \pi}{\partial q_2} : 448 - q_1 - 4q_2$

$= 448 - q_1 - 4(448 - 4q_1)$

$= 448 - q_1 - 1792 + 16q_1$

$= -1,344 + 15q_1$

$q_1 = 89.6$

In cournot equilibrium firm outputs, they have simultaneous quantity choice

The quantity that maximize profit of firm 1 is 89.6

The quantity that maximize profit of firm 2 is 89.6

b) assume firm 1 is leader

(follower) firm 2 : $\pi_2 = P \times q_2 - TC_2$

$= (448 - (q_1 + q_2))q_2 - q_2^2$

$= 448q_2 - q_1q_2 - q_2^2 - q_2^2$

$= 448q_2 - q_1q_2 - 2q_2^2$

$\frac{d\pi}{dq_2} = 448 - q_1 - 4q_2$

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

for firm 1 : $\pi_1 = P \times q_1 - TC_1 = (448 - (q_1 + q_2))q_1 - q_1^2$

$= 448q_1 - q_1^2 - q_1q_2 - q_1^2$

$= 448q_1 - 2q_1^2 - q_1q_2$

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

$= 448q_1 - 2q_1^2 - 112q_1 + \frac{q_1^2}{4}$

$\frac{d\pi}{dq_1} = 448 - 4q_1 - 112 + \frac{1}{2}q_1$

$= 336 - 4q_1 + \frac{q_1}{2}$

$q_1 = 96$

sub $q_1 = 96$ into $q_2 = \frac{448 - q_1}{4} = \frac{448 - 96}{4} = 88$

The Stackelberg equilibrium firm outputs. It is one firm act as quantity leader, choosing its quantity first. In this case assume firm 1 is leader which have output 96 to maximize profit. The firm 2 is follower have output 88

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 FMCG industry is fast-moving consumer goods that products sell quickly and at a low cost. The products in this industry have a short life because consumer demand is high. Therefore, consumers will purchase it frequently, at a low price and in large quantities. On the shelf at the store, this type of product also has a high turnover. The dominant firm is the firm that has a large share of the market and sell product for the residemand. The majority of market dominance firms account for 40% or more of the market. Therefore, the dominant firm in this industry is Nestle, which accounts for 44.9% of the regional share of worldwide sales and operates in many countries around the world. The product that makes the highest number of sales is Nescafe. In one industry, it needs to have both a dominance firm and a fringe firm. The fringe firm is the group of smaller firms. Therefore, the fringe firm, which is Doi Chang, which sells beverage products, The reason that I chose Doi Chang, one of the fringe firms in the FMCG industry, is that it has less revenue than Nestle. In addition, DOi Chang sell coffee which similar to Nescafé. It still get lower revenue and some product of Doi Chang have higher price than Nescafé. Doi Chang can sell product to some customers but can't support whole the market. The residual demand that Doi Chang and other fringe firm cannot support Nestle will sell their product to the residual demand.Moreover, it also has fewer branches in the world and it also has fewer types of products than Nestle. The Nescafé , which is dominance firm, have revenue more than Doi Chang