1. $Q(P) = P^{\varepsilon}$

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

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

$$= \varepsilon$$

∴ Elastricity of demand is ε

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

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

$$TR = P \times Q$$

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

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

profit maximization condition

$$MC = MR$$

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

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

$$2 = Q^{\frac{1}{3}}$$

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

$$\frac{dQ}{dP}\ \frac{P}{Q} = \varepsilon \times \frac{Q^{\frac{1}{3}}}{Q}$$

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

$$\frac{dQ}{dP}\ \frac{P}{Q} = -16$$

$Q = 10 - P$

$P = 10 - Q$

Maximizing price is $P = 10 - Q$

2. profit maximize condition

$MC = MR$

$TR = 100 - Q^2$

$MR = 10 - 2Q$

$10 - 2Q = 0$

$10 = 2Q$

$Q = 5$

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 some 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

$MR_1 = MC_1$
$448 - 2Q_1 - Q_2 = 2Q_1$
$448 - Q_2 = 4Q_1$
$Q_1 = 12 - 0.25Q_2$ ——— 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

$MR_2 = MC_2$
$448 - Q_1 - 2Q_2 = 2Q_2$
$448 - Q_1 = 4Q_2$
$Q_2 = 12 - 0.25Q_1$

solve firm two and firm one reaction functions simultaneously

sub ② in ①
$Q_1 = 12 - 0.25(12 - 0.25Q_1)$
$Q_1 = 12 - 3 + 0.0625Q_1$
$0.9375Q_1 = 9$
$Q_1 = 9.6$ units

sub $Q_1 = 9.6$ in ②
$Q_2 = 12 - 0.25(9.6)$
$Q_2 = 9.6$ units

$\therefore Q_1 = Q_2 = 9.6$ units

b.) find the stacklenberg firm outputs

Assume firm are as leader and firm two as follower

$Q_1 = 12 - 0.25Q_2$
$P = 448 - (12 - 0.25Q_2) - Q_2$
$P = 448 - 12 + 0.25Q_2 - Q_2$
$P = 36 - 0.75Q_2$

Find marginal revenue firm two

$TR_2 = P \cdot Q_2$
$TR_2 = (36 - 0.75Q_2)Q_2$
$TR_2 = 36Q_2 - 0.75Q_2^2$
$MR_2 = 36 - 1.5Q_2$

Profit maximize condition

$MR_2 = MC_2$
$36 - 1.5Q_2 = 2Q_2$
$3.5Q_2 = 36$
$Q_2 = 10.29$ units
sub Q_2 back to equation
$Q_1 = 12 - 0.25(10.29)$
$Q_1 = 9.43$ units
$Q_2 = 10.29$ units
$Q_1 = 9.43$ units

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

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for the Fringe Firms are shells, Bangjak, ESSO.