Week 12

Tuesday, 16 April 2024 18:03

Q2) $C(q) = q^3 - 4q^2 + 6q$

$MC = 3q^2 - 8q + 6$

$P = MC$

$\Rightarrow 3q^2 - 8q + 6 = P$

$AC = MC$

$AC = q^2 - 4q + 6$

$q^2 - 4q + \cancel{6} = 3q^2 - 8q + \cancel{6}$

$2q^2 - 4q = 0$

$2q(q-2) = 0$

$q = 0, 2$

$P = 3q^2 - 8q + 6$

$P = 3\times4 - (8\times2) + 6$

$P = 18 - 16 = 2$

Q3) $AC = MC = 10$

$q = 100 - \frac{P}{2}$

a) socially optimal case

$P = MC = AC$

$P = 10$

$q = 100 - \frac{10}{2} = 95$

b) $R = Pq$

$P = 200 - 2q$

$R = (200 - 2q)q = 200q - 2q^2$

$MR = \frac{dR}{dq} = 200 - 4q$

$MR = MC$

$200 - 4q = 10$

$\frac{190}{4} = q \Rightarrow q = 47.5$

$P = 200 - 2(47.5)$

$P = 105$

Q4) $Q = 800$

$P = 40$

$\varepsilon = -2$

a) $MC = P\left[1 + \frac{1}{\varepsilon}\right]$

$MC = 40\left[1 - \frac{1}{2}\right] = 20$

b) Markup $= \frac{P - MC}{P} = \frac{40 - 20}{40}$

$= \frac{1}{2}$

c) $AC = 15$ | $MC \neq AC$

$FC = 2000$

$\pi = ?$

$\pi = TR - TC$

$\pi = P.Q - (AC \times Q)$

$\pi = (40 \times 800) - (15 \times 800)$

$\pi = 20,000$

General:

$\max_Q \pi(Q) = P(Q).Q - C(Q)$

$\frac{d\pi}{dQ} = P(Q).1 + Q.\frac{dP}{dQ} - MC = 0$

$MC = P + Q\left(\frac{dP}{dQ}\right)$

$MC = P\left[1 + \frac{dP}{dQ}\cdot\frac{Q}{P}\right]$

$MC = P\left[1 + \left(\underbrace{\frac{Q/P}{dQ/dP}}_{\varepsilon}\right)\right]$

$MC = P\left[1 + \frac{1}{\varepsilon}\right]$

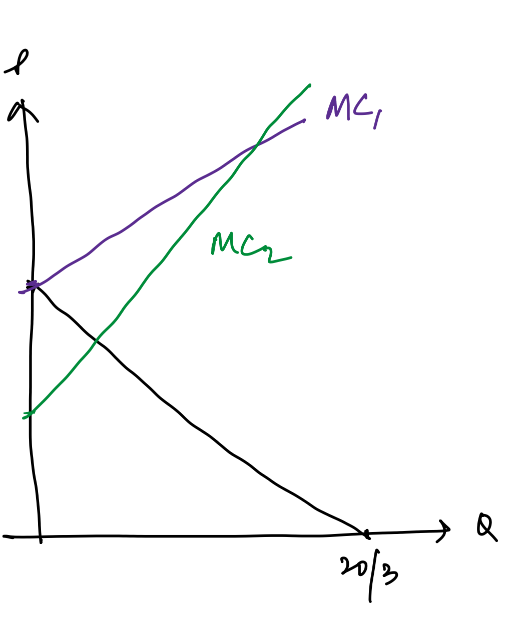
Q5) $MC_1 = 20 + 2Q_1$

$MC_2 = 10 + 5Q_2$

$P = 20 - 3Q$

$Q = Q_1 + Q_2$

Since MC_1 lies above the demand curve for all Q_1, it cannot produce, given the market demand.



$\therefore Q_1 = 0$

$Q = Q_2$

$P = 20 - 3Q_2$

$TR = P.Q = (20 - 3Q_2)Q_2 = 20Q_2 - 3Q_2^2$

$TC = C_2(Q_2)$

$MR = \frac{dR}{dQ_2} = 20 - 6Q_2$

$MR = MC_2$

$20 - 6Q_2 = 10 + 5Q_2$

$Q_2 = \frac{10}{11} = 0.91$

$P = 20 - 3Q_2 = 20 - 3\times0.91 = 17.273$

Q8) $C_1 = 60Q_1$

$C_2 = 60Q_2$

$P = 300 - Q = 300 - (Q_1 + Q_2)$

$\pi_1 = P.Q_1 - C_1$

$\pi_1 = (300 - Q_1 - Q_2)Q_1 - 60Q_1$

$\pi_2 = PQ_2 - C_2$

$\pi_2 = (300 - Q_1 - Q_2)Q_2 - 60Q_2$

For profit max^n

$\frac{d\pi_1}{dQ_1} = 300 - 2Q_1 - Q_2 - 60 = 0$

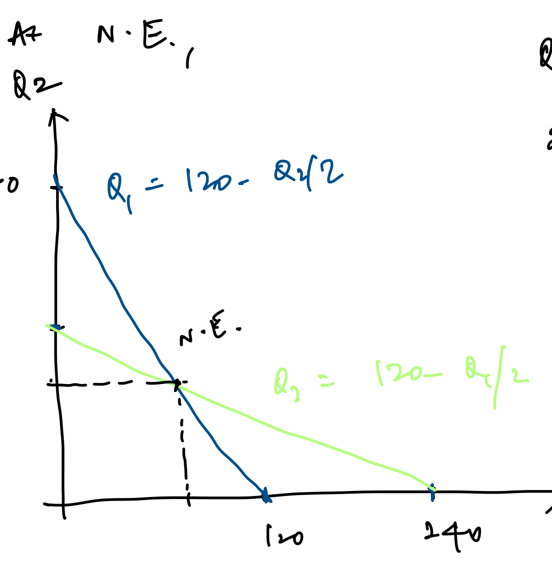
$\Rightarrow \frac{240 - Q_2}{2} = Q_1$ = Best response function of firm 1

Similarly,

$\frac{d\pi_2}{dQ_2} = 300 - 2Q_2 - Q_1 - 60 = 0$

$\Rightarrow \frac{240 - Q_1}{2} = Q_2$ = Best response function of firm 2.

At N.E.,



$Q_1 = Q_2$ gives the N.E

$\frac{240 - Q_1}{2} = Q_1$

$\Rightarrow Q_1 = \frac{240}{3} = 80$

$Q_2 = 80$

$Q^* = 80 + 80 = 160$

$P^* = 300 - 160 = 140$

Q9) $P = 300 - Q = 300 - (Q_1 + Q_2)$

$P = 300 - \left[Q_1 + \frac{240 - Q_1}{2}\right]$

$P = 300 - \left[\frac{2Q_1 + 240 - Q_1}{2}\right]$

$P = 180 - \frac{Q_1}{2}$

$\pi_1 = PQ_1 - C_1$

$\pi_1 = \left(180 - \frac{Q_1}{2}\right)Q_1 - 60Q_1$

$\frac{d\pi_1}{dQ_1} = 180 - Q_1 - 60 = 0$ for max^n

$Q_1 = 120.$

$Q_2 = \frac{240 - 120}{2} = 60$

$P = 300 - (120 + 60) = 120$