

Final

a) a)

True.

b) Advertising.

c) ~~Decrease~~ Ambiguous,

d) Increase.

e) Ambiguous.

f) broad.

g) 3400.

h) 0.

i) 10000

j) ~~8.89~~ $\hat{n} = (a - c) \frac{1}{\sqrt{F}} - 1 = \frac{20 - 2}{\sqrt{2}} - 1 = 11.72 \approx 11$

k) $\hat{n} = 8.89 \Rightarrow 8$ $P = \frac{a + nc}{n+1} = \frac{15 + 8 \times 1}{9} = 2.56$

l) True.

m) Less competition.

n) R&D.

o) Cost efficiency.

100%
unit

100

(a)

minimum A
(d)

maximum A
(b)

maximum

(b)

maximum A

(b)

maximum (f)

0.100

(f)

0 (d)

0.0001 (g)

$$100\% = 1 - \frac{5}{50} = 0.8 = 1 - \frac{L}{L+D} = 0.8 \quad (c)$$

$$20\% = 0.8 + 0.1 = 0.9 \quad 80\% = 0.8 \quad (d)$$

unit (j)

radioactive waste (m)

radioactive (n)

radioactive (o)

①

Q2.

$$S: q_s = 80 - 2p \quad (p = p^*)$$

$$ns: q_{ns} = 85 - p_{ns}$$

$$\text{Optimal price: } p^* = \frac{85 + 15}{2} = 50$$

② Let $q_s + q_{ns} = q$; $p_s = p_{ns} = p$

$$\text{If } p \geq 40 \Rightarrow q_s = 0$$

$\therefore p > 40$ no solution

Demand:

$$q = 85 - p \quad \text{if } p \geq 40$$

$$q = 165 - 3p \quad \text{if } p < 40$$

Marginal revenue:

$$MR = 85 - 2q \quad \text{if } q \leq 40$$

$$MR = 55 - \frac{2q}{3} \quad \text{if } q > 40$$

Case 1: $q \leq 40$

$$85 - 2q = 15 \Rightarrow q = 30 \Rightarrow p = 55$$

$$\text{Profit: } 55[30 - 15] = 30[55 - 15] = 1200$$

Case 2: $q > 40$

$$55 - \frac{2q}{3} = 15 \Rightarrow q = 15 \Rightarrow p = 35$$

$$\text{Profit: } 15[15 - 15] = 120[15 - 15] = 0$$

$$q = 60 \Rightarrow p = 35$$

$$\text{Profit: } 60[35 - 15] = 1200$$

Indifferent

Q3

$$\pi_2 = q_2(100 - q_1 - q_2) \quad p - q_2 = p - q_1$$

SP

(a)

$$\frac{\partial \pi_2}{\partial q_2} = 0 : 100 - q_1 - 2q_2 = 0$$

$$\Rightarrow q_2 = \frac{50 - q_1}{2} \quad p = q_1 + q_2 \quad (1)$$

$$0 \leq p < q_1 + q_2$$

Problem of F1:

$$\pi_1 = q_1(100 - q_1 - q_2(q_1)) - q_1^2$$

$$0 \leq q_1 \leq 50 - q_2 \quad [100 - q_1 - 50 + \frac{q_1}{2}] q_1 - q_1^2$$

$$(50 - \frac{q_1}{2}) q_1 - q_1^2$$

$$0 \leq p \leq p - q_2 = 2q_1$$

$$0 \leq p \leq \frac{\partial \pi_1}{\partial q_1} = 0 : 50 - q_1 - 2q_1 = 0$$

$$\Rightarrow q_1 = \frac{50}{3}$$

$$CE = q_1 \leq 0 \leq p \quad CE = p - q_2$$

$$COSt = (21 - 0.5) \times 22 = 44$$

$$COSt =$$

$$21 - 0.5 \times 22 = 16$$

$$0.5 \times 22 = 11$$

$$CE = q_1 \leq 0 \leq p$$

$$COSt = 21 - 0.5 \times 22 = 11$$

Therefore

①

b)

In order for firm 2 to enter, we need

$$\pi_2(q_1) \geq 0$$

$$[100 - q_1 + q_2(q_1)] q_2 - 16 \geq 0.$$

$$[100 - q_1 - 50 + \frac{q_1}{2}] [50 - \frac{q_1}{2}] - 16 \geq 0.$$

$$\left[50 - \frac{q_1}{2}\right]^2 \geq 16.$$

$$\Rightarrow 50 - \frac{q_1}{2} \geq 4$$

$$46 \geq q_1$$

$$192 \geq q_1$$

$$[(q_1 = 192) \text{ and } q_1 \geq 0] \Rightarrow q_1 = 192$$

$$0 = q_1 - \frac{q_1^2 + 8q_1 - 96}{2} \Rightarrow q_1 = 192$$

$$\frac{q_1 + 8}{2} (q_1 - 192) < 0$$

$$\frac{q_1^2 + 8q_1 - 96}{2} < 0 \Rightarrow q_1 < 192$$

Q4

a)

Marginal Consumer

$$P_1 + x = P_2 + (0.6 - x)$$

$$\text{② } \sum \partial I = \text{df} \quad C_P \partial p + C_V \partial V$$

$$2x = p_2 + 0.6 - p_1$$

$$\delta = \frac{p_2 - p_1}{2} + 0.3$$

Demands

$$q_1 = 100 \left[0.3 + \frac{p_2 - p_1}{2} \right]$$

$$q_2 = 100 [0.7 + \frac{p_1 - p_2}{2}]$$

$p_1 \leq \$77$

b)

1st problem

$$\pi_1 = p_1 q_1 = p_1 \left[\frac{100}{2} (0.3 + \frac{p_2 - p_1}{2}) \right]$$

$$\frac{\partial \Pi_1}{\partial p_1} = 0 : \pi 0.3 + \frac{p_2}{2} - p_1 = 0$$

$$\Rightarrow p_1(p_2) = 0.3 + \frac{p_2}{2}$$

Analogously :

$$P_2(P_1) = 0.7 + \frac{P_1}{2}$$

(3)

Subbing $p_2(p_1)$ into p_1 .

$$p_1 = 0.3 + \left(0.7 + \frac{p_1}{2} \right)$$

$$\underline{p_1 = 0.3 + \frac{1.4 + p_1}{4}}$$

$$\underline{4p_1 = 1.2 + 1.4 + p_1}$$

$$\Rightarrow p_1 = \frac{2.6}{3} \Rightarrow p_2 = 0.7 + \frac{2.6}{6}$$

$$2p - p^2 = 0.867 \quad p < \frac{8}{6} = 1.13$$

$$p! = \frac{2}{3} = \frac{2}{6-1}$$

$$x + p < 1$$

$$x + p = 2x - 2p$$

$$2x - 2p = 2x - 2p$$

$$x + p < 1 \quad \text{and } x < 1$$

Q5

a)

~~If claim (q) is paid in 2~~

Payoff under (T, L) : $7 + \delta^2 = 7$

$$8 + \delta 8 + \delta^2 8 + \dots = \frac{8}{1-\delta}$$

Deviation Payoff:

$$9 - \delta 8 + \delta^2 9 = 9$$

To sustain: $9 - \delta 8 = 9$

$$\frac{8}{1-\delta} > 9 \Rightarrow 8 > 9 - 9\delta \\ \Rightarrow 8 > \frac{1}{9}$$

b)

Payoff T_L :

$$\frac{8}{1-\delta} = \frac{8}{0.5} = 16$$

Payoff devⁿ:

$$9 + \chi 8 + \chi \delta^2 + \dots$$

$$9 + \frac{\chi 8}{1-\delta} = 9 + \frac{\chi 0.5}{0.5}$$

$$\begin{aligned} \text{To sustain } 16 &> 9 + \chi \\ \Rightarrow 7 &> \chi \end{aligned}$$

Q6)

a) Retailer's prob.

$$MR = MC$$

$$20 - 4q = w$$

$$\Rightarrow \frac{20-w}{4} = q$$

M's prob:

$$\pi_m = (w - c)q = wq = w \left[\frac{20-w}{4} \right]$$

$$\frac{\partial \pi_m}{\partial w} = 0 : \frac{20-2w}{4} = 0$$

$$\Rightarrow \boxed{w = 10} \Rightarrow \boxed{q = 2.5}$$

$$\begin{aligned}\pi_m &= 10 \times 2.5 = 25 \\ \pi_r &= 2.5 [15 - 10] = 12.5\end{aligned}$$

$$\pi_m + \pi_r = 27.5$$

b)

$$\pi_c = (20 - 2q)q - \frac{c}{q} = (20 - 2q)q$$

$$\frac{\partial \pi_c}{\partial q} = 0 : 20 - 4q = 0 \Rightarrow q = 5 \Rightarrow p = 10.$$

$$\text{Profits} = 50.$$

3)

along z-axis

(d)

$$\omega = \omega_0 + \Delta\omega$$

$$\omega = \omega_0 + \frac{\Delta\omega}{n}$$

$$P = \frac{\omega - \omega_0}{\Delta\omega} \cdot P_0$$

along x-axis

$$\left[\frac{\omega - \omega_0}{\Delta\omega} \right]_{\text{avg}} = P_0 = P(\omega - \omega_0) = m\pi G$$

$$0 > \frac{\omega - \omega_0}{\Delta\omega} > 0 = m\pi G$$

$$2.8 = P_0 \in [0.1 \text{ to } 5]$$

$$2.8 = 2.8 \times 10^{-10} \text{ Nm}^2$$

$$2.8 = [0.1 - 2.1] \times 10^{-10} \text{ Nm}^2$$

$$2.8 \times 10^{-10} = 10^{-10} + m\pi G$$

$$P_0(10^{-10}) = \frac{2.8}{10^{-10}} = P_0(2.8 \times 10^{-10}) = m\pi G$$

$$0.1 = 10^{-10} - 2.8 \times 10^{-10} \quad P_0 = 10^{-10}$$

$$0.1 = 10^{-10} - 2.8 \times 10^{-10}$$