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Econ 110
Lovell
Problem set 6

a)
1. $AC = \frac{c(q)}{q} = 16 + 4q + q^2$

$AC = \frac{16}{q} + 4 + q$

$\frac{dAC}{dq} = \frac{-16}{q^2} + 1 = 0$

ATC is min when ATC = MC $\Longrightarrow$ $4 + 2q^2 = 16 + 4q + q^2$

$2q^2 - q^2 - 16 = 0$

$q^2 - 16 = 0$

$q = 4$

$\boxed{q = 4}$ → ATC is min when $q = 4$

$MC = \frac{d(q)}{q}$

$AC = \frac{16}{4} + 4 + 4 = 12$

$MC = 4 + 2q$

$\boxed{MC = 12}$

$\boxed{AC = 12}$

b) $P = \frac{c(q)}{q} = \frac{16 + 4q + q^2}{q} = \frac{16}{4} + 4 + 4 = 12$

$\boxed{P = 12}$

$\boxed{q = 4}$ ↑

c) $Q = 1000 - 10(P)$

$Q = 1000 - 10(12)$

$\boxed{Q = 880}$

$1000 - 120 = 880$

$n = \frac{Q^e}{q_{be}} = \frac{880}{4} = 220$

$\boxed{n = 220}$

d) \$1.00 unit tax

consumer price = \$12 (stays the same)

ATC = \$13 → MC + 1 = 12 + 1 = 13

$n = 220 - 1 = 219$

$\frac{c(q)}{q} = 16 + 5q + q^2$

$1000 - 10p = Q$

$1000 - 10(13) = Q$

$1000 - 130 = Q_{market}$

$870 = Q_{market}$

$q = 4$

$\boxed{n = \frac{870}{4} = 217.5}$

long profits will always = 0
∴ they will remain zero.

on pg 206

2. $\frac{dAC}{dq} = 0$ > AVC at min.

$0 = \left(\frac{dAC}{dq} = \frac{MC}{q} - \frac{c(q)}{q^2}\right)^{q} = 0$

$\frac{q\,d(AC)}{d} = MC - \frac{c(q)}{q^2}$

$MC - AC = 0$

3. $p(q) = 20 - 2q \longrightarrow$ y-int $p(0) = 20 - 2(0)$

$c(q) = q + q^2$ $\quad p(0) = 20 \rightarrow$ y-int

price * quan.

a) $R(q) = qP(q) = 20q - 2q^2$

$\frac{dR(q)}{dq} = \boxed{20 - 4q = MR}$

MC = MR

$\boxed{2q + 1 = MC}$

(profit)

Rev - cost

$\pi = PQ - C(q)$

$\pi = PQ - (q + q^2)$

$20 - 4q = 2q + 1$

$19 = 6q$

$q = \frac{19}{6}$

$\frac{(20 - p^*)\,q^*}{2} = CS$

$p(q) = 20 - 2\left(\frac{19}{6}\right)$

$\boxed{p(q) = 13.6}$

nice!

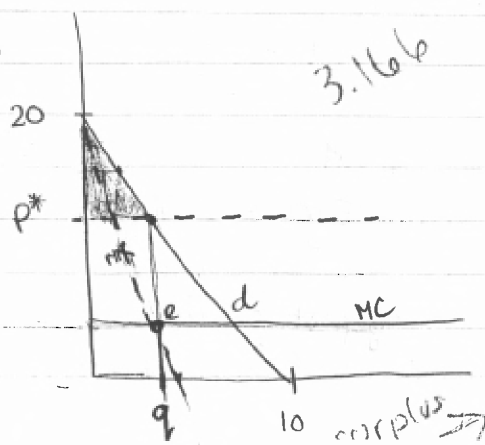
$c(q) = (19/6) + (19/6)^2$

$\boxed{c(q) = 13.19}$

b)

3.166

use graphing calc.



$P \cdot q - c$ = Total Profits

$(13.6)(19/6) - (13.19) = 29.876$

$CS = \frac{q \cdot (\text{y-int} - P)}{2}$

surplus $\Rightarrow$ $\boxed{CS = \frac{19/6\,(20 - 13.6)}{2} = 10.1312}$

5. $P_1 = 10 - \frac{q_1}{2}$ production cost $\Rightarrow C(q_1, q_2) = 2(q_1 + q_2)$

p. 283

$P_2 = 20 - \frac{q_2}{4}$

$\pi(q_1, q_2) = R_1(q_1) + R_2(q_2) - C(q_1 + q_2)$

$\left(10 - \frac{q_1}{2}\right) q_1 + \left(20 + \frac{q_2}{4}\right) q_2 - 2(q_1 + q_2)$

~~R = P·C~~

$R(q) = P \cdot q$

$= 10q_1 - \frac{1}{2} q_1^2 + 20q_2 + \frac{q_2^2}{4} - 2q_1 - 2q_2$

$\frac{d\pi}{dq_1} = 10 - q_1 - 2 = 0$ $\boxed{q_1 = 8}$ $10 - \frac{8}{2} = 6$ $P_1 = 6$

$\frac{d\pi}{dq_2} = 20 - \frac{2q_2}{4} - 2 = 0$ $18 = \frac{2q_2}{4}$

$2q_2 = 72$ $20 - \frac{36}{4}$

$\boxed{q_2 = 36}$ $20 - 9 = 11$

$P_2 = 11$

Profit maximizing level for out $\Rightarrow$

$\frac{dR}{dq} = \frac{dc}{dq} = P$

$\boxed{q = 44}$

$q = q_1 + q_2$

$C(q_1, q_2) = 2(6 + 11)$

$C(q_1, q_2) = 2(17)$

$\boxed{C(q_1, q_2) = 34}$

same as table 6.2

6. $q_i = \frac{10(11 - p_i + 0.75\bar{p})}{n^{0.5}}$

$C = 64 + 4q_i$

fixed cost of \$64

$MC = AVC = \$4$

a. $\bar{p} = 12$ is the best

$p_i = 12$ ⟹

$\pi = p_i \cdot q_i - C(q)$

$\pi = 10p_i \frac{(11 - p_i + .75\bar{p})}{25^{.5}} - (64 + 4q_i)$

$\frac{d\pi}{dp_i} = 22 - 4p_i + 8$

$0 = 30 - 4p_i$

plug in → $\boxed{p_i = 7.5}$

$\pi = 23.5$

$\pi - \$64 =$

\$23.5 − \$64 = neg!

No, the company will not make a positive after tax profit

b. $q_i = \frac{10(11 - 7.5 + .75(12))}{5} = 34$

$\pi = 7.5(34) - (64 + 4(34))$

$= 53, -9$ ⟹ after taxes

what price should they charge?

yes, B/C consumers would buy from firm.

c. $q = \frac{10(11 - .25(18))}{5} = 13$

$\pi = 18(13) - (64 + 4(13)) = 118$

$\pi \neq 0$

∴ not long run competitive equilibrium

$q = \frac{10(11 - .25(12))}{5} = 16$

$\pi = 12(16) - (64 + 4(16)) = 64$

⟹ after taxes

$\pi = 0$

this long run competitive equilibrium