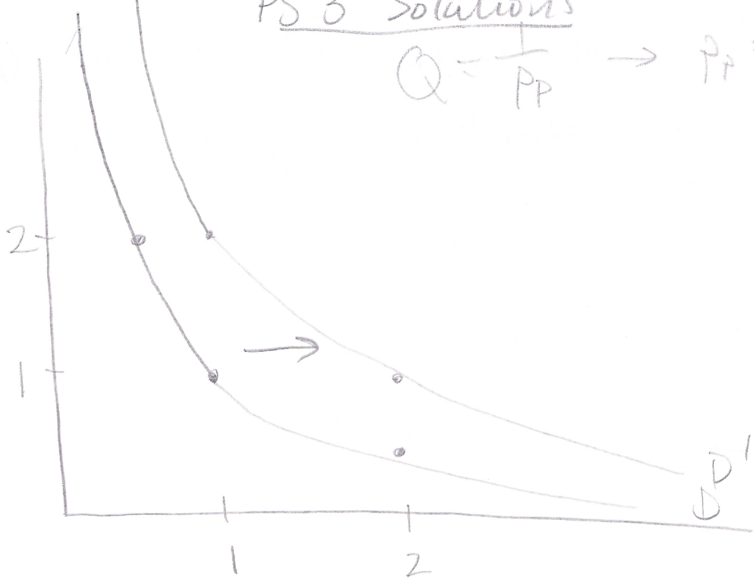
PS 3 Solutions

(1) (a) $Q = \frac{1}{P_P} \rightarrow P_P = \frac{1}{q_D}$



(b) $Q = \frac{2}{P_P} \rightarrow P_P = \frac{2}{q_D}$

Demand has increased due to $\Delta m > 0$, shifting to the right.

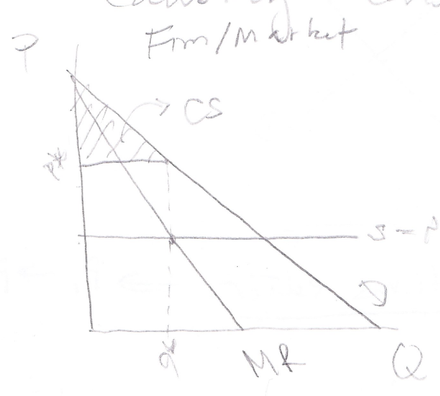
(c) Normal good. $Q_D = \frac{m}{2P_P}$: as $m \uparrow$, $q_D \uparrow$

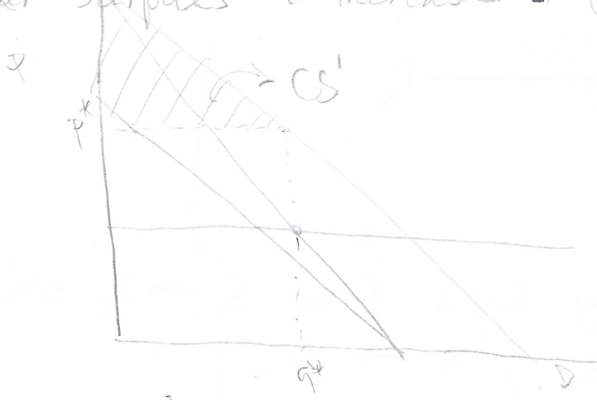
$\Rightarrow$ normal good.

An increase in income leads to an increase in demand.

(d) No. if both are inferior, it violates the assumption of non-satiation. At (0,0), you'd be satiated. Also, using a preference map is impossible.

(2) (a) Uncertain. Consider a large increase in demand, causing consumer surplus to increase. $CS' > CS$.





② ⓑ Uncertain. True for most cases, but if AC declines forever like in a natural monopoly, then $MC \neq AC \ \forall \mathbb{R}_+$.

③ ⓐ $AC = \frac{5}{y} + \frac{3}{2}y$ for $y > 0$, otherwise 0

$MC = 3y$ for $y > 0$, otherwise 0

ⓑ $MC,\ p > AC$ in LR.

$MC = AC$ in LR $\Rightarrow$ $\frac{5}{y} + \frac{3}{2}y = 3y$

$\frac{5}{y} = \frac{3}{2}y$

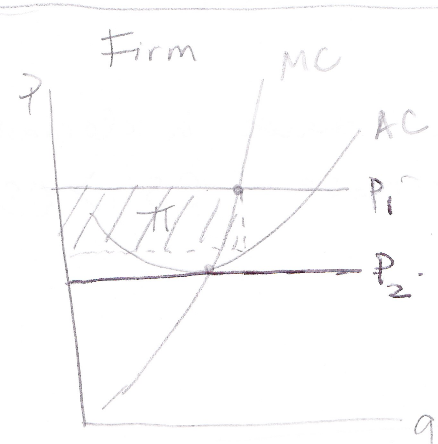
$5 = \frac{3}{2}y^2$

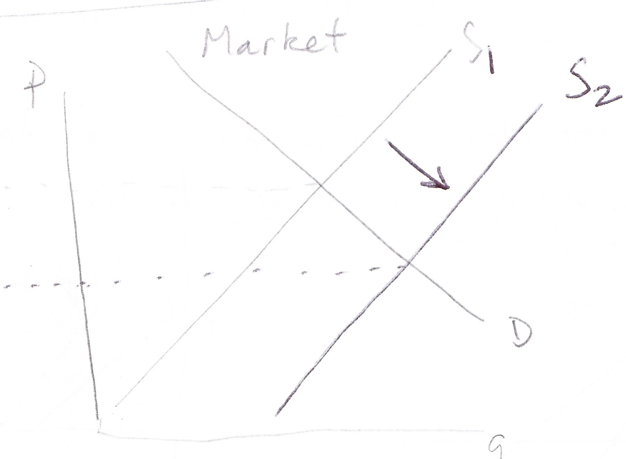
$\sqrt{\frac{10}{3}} = y^*$

$MC(y^*) = 3\sqrt{\frac{10}{3}} = \sqrt{30}$

$$\boxed{\text{Supply: } y = \begin{cases} \frac{p}{3}, & p > \sqrt{30} \\ 0 & \text{otherwise} \end{cases}}$$

ⓒ

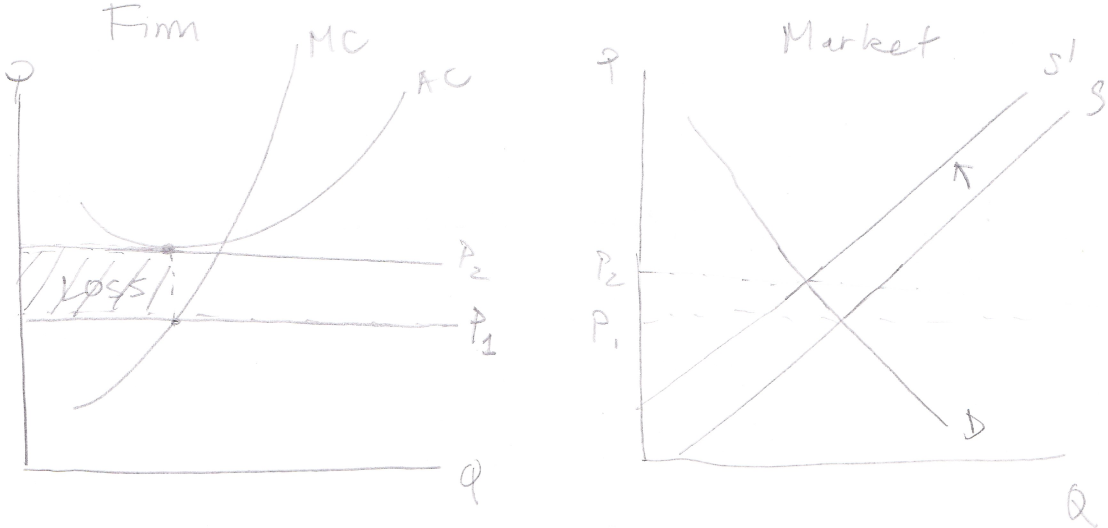




In LR, supply shifts from $S_1 \to S_2$ since <u>firms enter</u>. $\Rightarrow P_1 \to P_2$

As $P_1 \to P_2$, $\pi \to 0$.

(3) (d)



Firms exit, causing $S \to S'$. As $S \to S'$, $P_1 \to P_2$.

As $P_1 \to P_2$, $\pi_1 \to 0$.

(4) (a) Monopoly $MR = MC$

$Q_D = 5500 - \frac{1}{2}P$ $\quad\quad MC = 2000$

$\frac{1}{2}P = 5500 - y$

$P = 11000 - 2y$

$R = py = (11000 - 2y)y$

$MR = 11000 - 4y$

$MR = MC$

$11000 - 4y = 2000$

$\frac{9000}{4} = \frac{4y}{4}$

$2250 = y^*$

$p = 11000 - 2(2250) = \$6500$

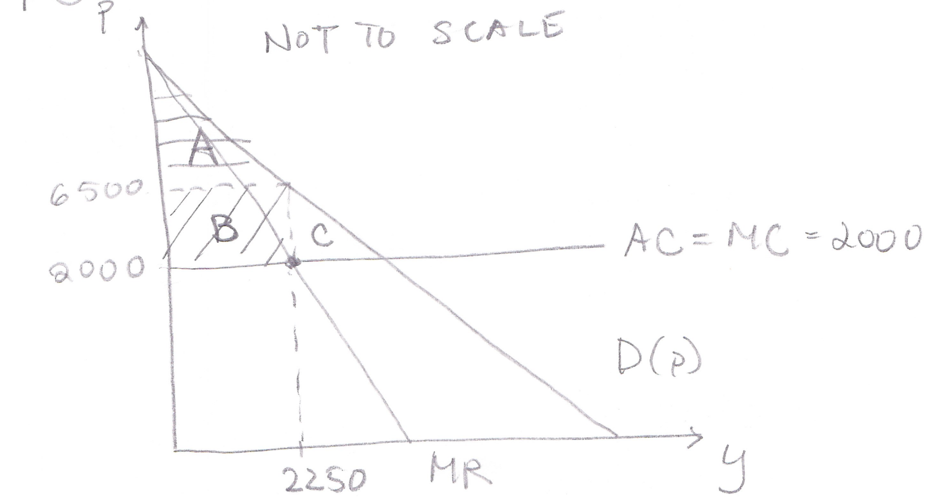
$\boxed{p^* = 6{,}500}$

(b) $\pi = (P - AC)Q$ $\quad\quad AC = \frac{2000y}{y} = 2000$

$\pi = (6500 - 2000)2250$

$\boxed{\pi = 10.125 \text{ million}}$

4 ⓒ



A = Consumer surplus
B = profits
C = deadweight loss

ⓓ $MS(p) = \sum_{i=1}^{100} q_s(p) = 2000 = MC$

$Q_s = Q_D$ ← not possible since $Q_s(p) \rightarrow p = 2000$

$p_s = p_D$

$p_s = 2000$

$p_D = 11000 - 2y$

$2000 = 11000 - 2y$

$2y = 9000$

$y^* = 4500$

$p^* = 2000$

$$\boxed{\begin{aligned} p^* &= 2000 \\ y^* &= 4500 \end{aligned}}$$

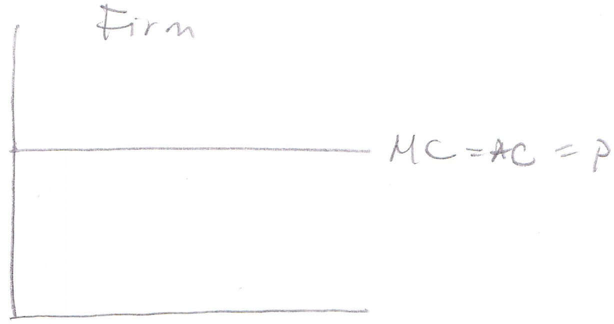
→ If there are 100 identical firms, it is quite difficult to say how much each will supply. This is b/c recall that p = MC. The lines in this case are parallel (i.e. the same).

All we can say is that:

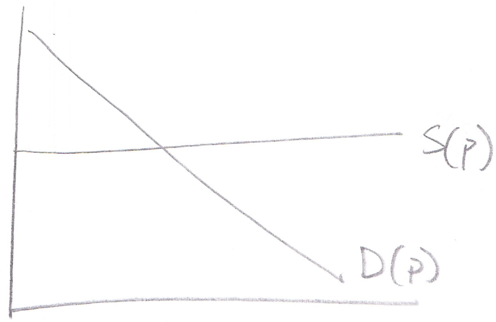
$$\sum_{i=1}^{100} q_f^i = 4500$$

4e

Firm



Market



4f $\boxed{\text{10.125 million}}$ / Anthony's profits

5 a

Males

$MR = MC$

$MR = 9.6 - .16y$

$0 = 9.6 - .16y$

$.16y = 9.6$

$y = \frac{9.6}{.16} = 60$

$P_M = 9.6 - .08(60) = 4.8$

$\boxed{P_M = 4.8}$

Females

$MR = 4 - 0.2y$

$0 = 4 - 0.2y$

$\frac{0.2y}{0.2} = \frac{4}{0.2}$

$y = 20$

$P_F = 4 - .1(20) = 2$

$\boxed{P_F = 2}$

5b

$TR_M = 4.8 \times 60 = 288$

$TR_F = 2 \times 20 = 40$

$$\boxed{\begin{aligned} TR_M &= 288 \\ TR_F &= 40 \end{aligned}}$$

Since there are no costs,

$\pi_{tot} = 288 + 40 = 328$

$\pi = 328$ or $\pi = 328 - FC$ since I was ambiguous

5c

$\sum q_D$

$q_m = ?$

$p_m = 9.6 - 0.08 q_m$

$\frac{0.08 q_m}{.08} = \frac{9.6 - p_m}{.08}$

$q_m = 120 - 12.5 p_m$ for $0 < p_m < 9.6$

$p_F = 4 - 0.1 q_F$

$0.1 q_F = 4 - p_F$

$q_F = 40 - 10 p_F$ for $0 < p_F < 4$

$$\therefore \boxed{D(p) = \begin{cases} 160 - 22.5p & \text{for } 0 < p < 4 \\ 120 - 12.5p & \text{for } p > 4 \end{cases}}$$

5c cont. 2 points where MR=MC

$MR_1 =$

$MR_2 = 9.6 - .16q$

$q = 60$
$p = 4.8$

$22.5p = 160 - q$

$p = \frac{160}{22.5} - \frac{1}{22.5}q$

$MR_1 = \frac{160}{22.5} - \frac{2}{22.5}q$

$\frac{160}{\cancel{22.5}} = \frac{2}{\cancel{22.5}}q$

$80 = q_2$

$P_2 = \frac{80}{22.5} = 3.\overline{5}$

$p_2 q_2 = 284.4 < 288 = p_1 q_1$

$\therefore$ $\boxed{\text{sells only to males and gets } \pi = 288}$