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Question 1

(a) $SRMC = 3Q^2 - 16Q + 30$
$SRAC = Q^2 - 8Q + 30 + \frac{5}{Q}$
$SRAVC = Q^2 - 8Q + 30$
(b) At $Q = 0 \Rightarrow SRMC = p = 30$
(c)

$$p = SRMC = 3Q^2 - 16Q + 30$$

$$Q = \frac{8 + \sqrt{3p - 26}}{3}$$

(d) $Q = 6 \Rightarrow SRMC = 42$
$\frac{d}{dQ}SRMC(6) = 20 > 0$
At $p = 42$, firm produce 6 units of output.
(e) At $p = 25$, each firm produces 5 units.
Demand = Supply
80 = 5n
n = 16 (firms)

2. a) $VC = 2Q^2$

$$SRMC = \frac{dVC}{dQ} = 4Q$$

Maximize, $P = SMRC = Q$

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

$\therefore P = 40,$

$Q = 10$

$TR = PQ$

$= 40 \cdot 10$

$= 400$

Zero profit, $TR = TC$

$400 = FC + VC$

$400 = F + 2Q^2$

$400 = F + 200$

$F = 200$

b) $NSFC = 25\% \times 200$

$= 50$

$TNSC = VC + NSFC$

$= 2Q^2 + 50$

$ANSC = \frac{TNSC}{Q}$

$= 2Q + \frac{50}{Q}$

Min: $\frac{dANSC}{dQ} = 0$

$2 - \frac{50}{Q^2} = 0$

$Q = 5$

$\therefore ANSC = 10 + 10$

$= 20$

$\therefore Q = \begin{cases} \frac{P}{4}, & P \geq 20 \\ 0, & P < 20 \end{cases}$

c) $S = 10Q$

$= 10 \times \frac{P}{4}$

$= \frac{5}{2} P$ when $P \geq 20$

at equilibrium,

$S = D$

$\frac{5}{2} P = 180 - \frac{5}{2} P$

$P = 36$

at $P = 36$, $Q = 9$

$\therefore \pi = PQ - (FC + VC)$

$= 36 \times 9 - (200 + 2 \times 9^2)$

$= 38$

d) At $P = 40$, profit $= 0$

$Q = \frac{40}{4}$

$= 10$

$\therefore D = 180 - \frac{5}{2}(40)$

$= 80$

therefore $\frac{Q_m}{Q_f} = \frac{80}{10} = 8$ firms in market

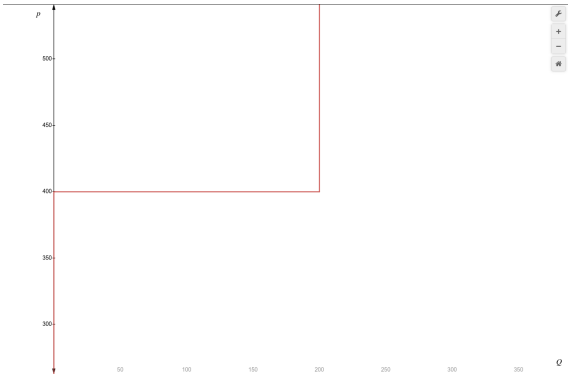
Question 3
(a) as firm is trying to maximize

$$profit = pQ - VC - FX$$

$$profit = Q(p - 400)$$

therefore:

$$Q = \begin{cases} Q_{max} = 200 & p > 400 \\ Any\, between\, 0 - 200 & p = 0 \\ 0 & p < 400 \end{cases}$$



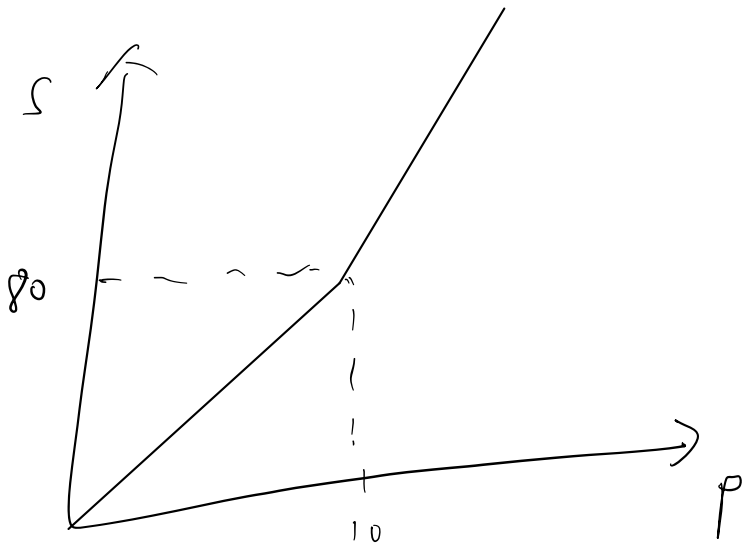
(b) Supply = Demand
At $p = 400$,
Demand = 16,000
$\Rightarrow$ Each firm produces 266.66 tons $>$ 200 tons cap.
At $p > 400$
Supply = 200 x 60 = 12,000 = Demand
p = 800

4. a) when $p < 10$, $S = 4(2p) = 8p$

$p \geq 10$, $S = 4(2p) + 6(p-10)$

$= 14p - 60$

$\therefore S = \begin{cases} 14p - 60 & p \geq 10 \\ 8p & p < 10 \end{cases}$



b) Case I: $p \geq 10$ equilibrium, $S = D$

$14p - 60 = 130 - 10p$

$p = 7$

however, the supply curve is valid for $p \geq 10$, not $p = 7$

so must less than 10

case II ; $p < 10$, equilibrium $S = D$

$8p = 108 - 10p$

$p = 6$

$\therefore p = 6$