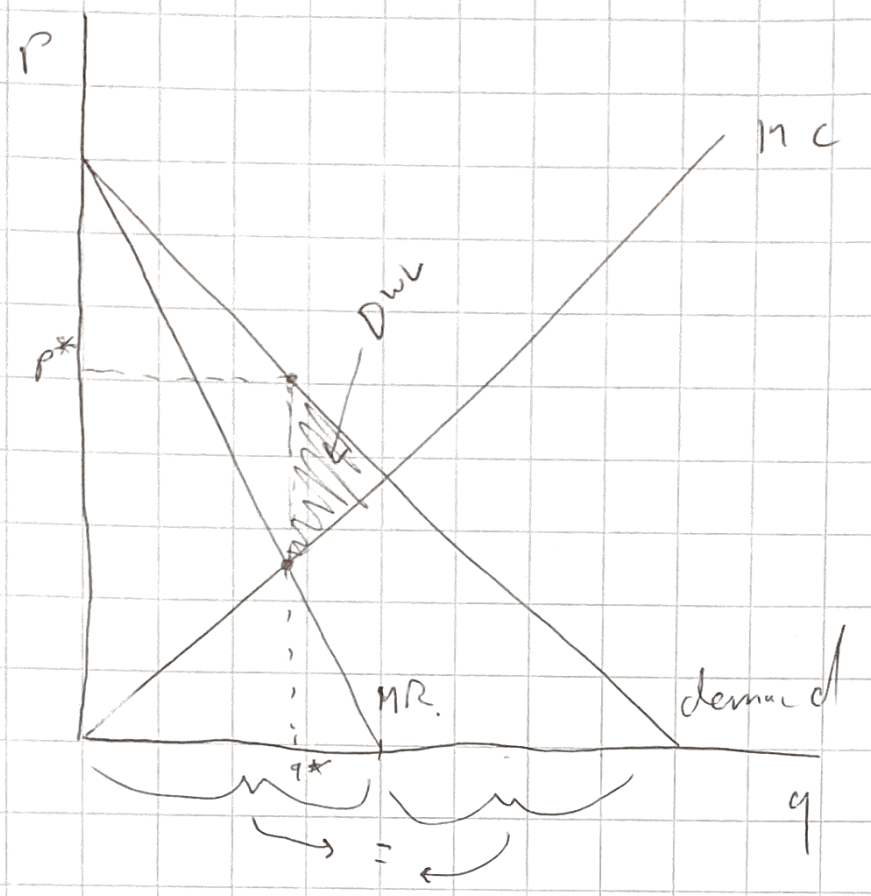
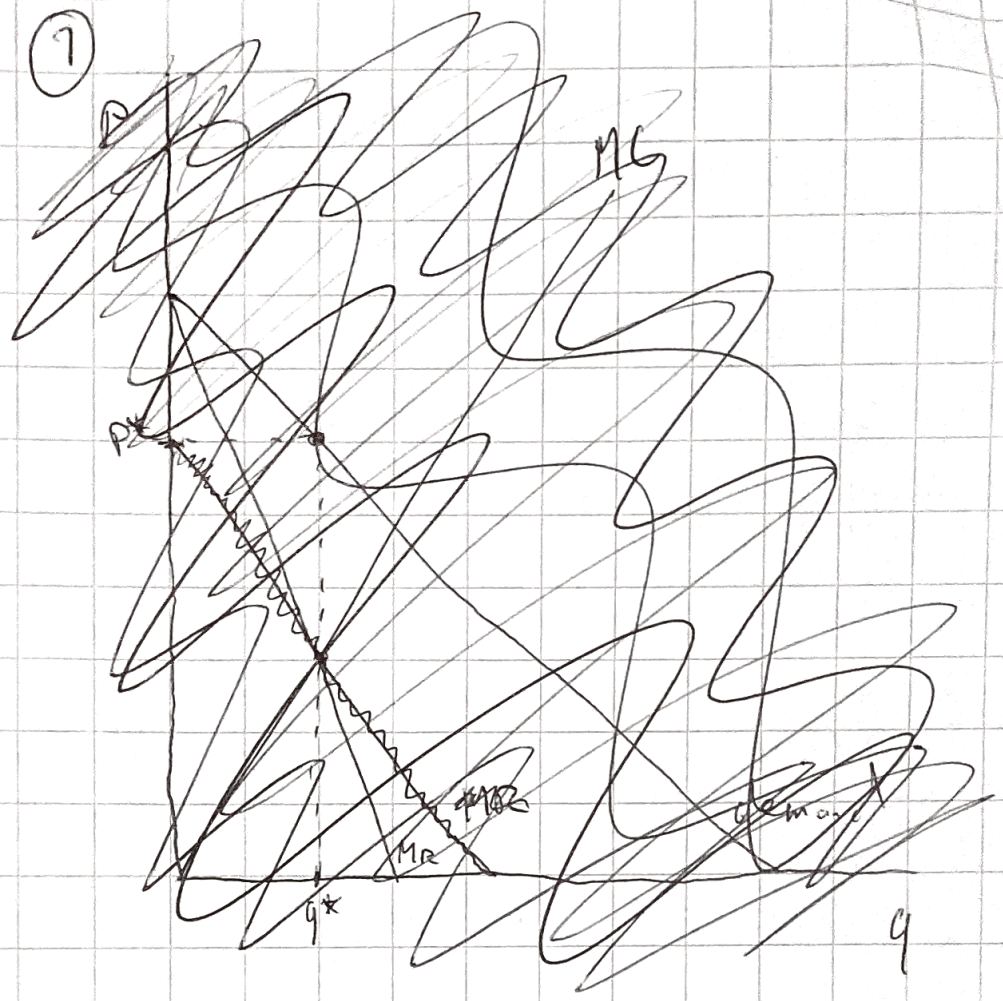
(1)



(7)



a. $R(q) = p(q) \cdot q$

So

$$MR(q) = p(q) \cdot \frac{dq}{dq} + \frac{dp(q)}{dq} q = p(q) + \frac{dp(q)}{dq} q$$

this is just the demand curve therefore, Because the demand curve is downward sloping (unless there is perfect competition) Because of the Law of Demand, $\frac{dp(q)}{dq} q < 0$. therefore, at any given q, MR is going to be $\frac{dp(q)}{dq} q$ less than the demand function,

therefore, it lies below the demand function. this also makes sense, if the firm increases its output with 1, it gains revenue from that unit (the $P(q)$ term in MR) But ~~redo~~ Because it has to lower its price it loses the difference in price (the $\frac{dP(q)}{dq} q$ term)

B. $$\varepsilon = \frac{dq}{dP} \frac{P}{q}$$

So Because $$MR = P + \frac{dP}{dq} q$$

$$= P + P \cdot \frac{dP}{dq} \frac{q}{P}$$

$$= P + P \frac{1}{\frac{dq}{dP} \frac{P}{q}}$$

$$= P \left(1 + \frac{1}{\varepsilon}\right)$$

Because when the firm is optimizing

$$MC = MR$$

$$MC = P\left(1 + \frac{1}{\varepsilon}\right)$$

$$\frac{P}{MC} = \frac{1}{1 + 1/\varepsilon}$$

$$P = \frac{MC}{1 + 1/\varepsilon}$$

c. No, there is no free entry and exit (it is a monopoly) so profits do not have to be 0. Therefore, Because $P = AC$ does not have to be true, production does not have to be at the minimum average cost.

d. Because a monopoly would set a price higher than its MC, consumers buy less of the good than in a competitive market, leading to a DWL. ~~(the triangle between the two)~~ See graph.

③ a. ~~$R_1 = P(q) q_1 = P(q_1 + q_2) q_1$~~

$= (72 - 3q_1 - 3q_2) q_1$

$= 72q_1 - 3q_1^2 - 3q_2 q_1$

$MR_1 = P(q) + P'(q) q_1 = 72 - 3q_1 - 3q_2 - 3q_1$

$= 72 - 6q_1 - 3q_2$

Firm 1 is trying to optimize, so:

$MR_1 = MC_1$

$72 - 6q_1 - 3q_2 = 12$

$$y_1 = 10 - \frac{1}{2} y_2$$

Because Firm 2 has the same MC,

$$y_2 = 10 - \frac{1}{2} y_1$$

So, outputs will be:

$$y_2 = 10 - \frac{1}{2}\left(10 - \frac{1}{2} y_2\right)$$

$$y_2 = 10 - 5 + \frac{1}{4} y_2$$

$$\frac{3}{4} y_2 = 5$$

$$y_2 = \frac{20}{3}$$

- Because the firms are equal $y_1 = y_2 = \frac{20}{3}$
- $P = 72 - 3 \cdot \left(\frac{20}{3} + \frac{20}{3}\right) = 72 - 40 = 32$
- $y = y_1 + y_2 = \frac{40}{3}$
- $\pi_1 = \pi_2 = 32 \cdot \frac{20}{3} - 12 \cdot \frac{20}{3} = 20 \cdot \frac{20}{3}$

$$= \frac{400}{3}$$

- $\Pi = \pi_1 + \pi_2 = \frac{800}{3}$

B. $$\frac{P - MC_i}{P} = \frac{S_i}{|\varepsilon|}$$

Because $S_i = \frac{1}{2}$ for every firm here (they are identical)

and $$\varepsilon = \frac{dq}{dP}\frac{P}{q}$$

$$q = 24 - \frac{1}{3}P$$

$$\frac{dq}{dP} = -\frac{1}{3}$$

$$\varepsilon = -\frac{1}{3} \cdot \frac{32}{40/3} = -\frac{4}{5}$$

so $$\frac{S_i}{|\varepsilon|} = \frac{5}{8}$$

and $$\frac{P - MC_i}{P} = \frac{32 - 12}{32} = \frac{5}{8}$$

C. $$HHI = \sum_{i=1}^{i=N} S_i^2 = \left(\frac{1}{2}\right)^2 + \left(\frac{1}{2}\right)^2 = \frac{1}{2}$$

d.

$MR_1 = 72 - 6y_1 - 3y_2$

$MR_1 = MC_1$ ⇔

$72 - 6y_1 - 3y_2 = 6$

$-6y_1 - 3y_2 = -66$

$y_1 + \frac{1}{2}y_2 = 11$

$y_1 = 11 - \frac{1}{2}y_2$

and for firm 2 it stays the same:

$y_2 = 10 - \frac{1}{2}y_1$

So:

$y_1 = 11 - \frac{1}{2}\left(10 - \frac{1}{2}y_1\right)$

$y_1 = 11 - 5 + \frac{1}{4}y_1$

$\frac{3}{4}y_1 = 6$

$y_1 = 8$

and $y_2 = 10 - \frac{1}{2} \cdot 8 = 6$

- $y_1 = 8$; $y_2 = 6$; $y = 14 > 40/3$ so more production
- $p = 72 - 3 \cdot 14 = 30 < 32$
- $\pi_1 = 8 \cdot 30 - 6 \cdot 8 = 192$; $\pi_2 = 6 \cdot 30 - 12 \cdot 6 = 108$; $\pi = 300 > 800/3$

~~HHI = $\sum_{i=1}^{i=N} s_i \cdot \frac{p - mc_i}{p}$~~

$$s_i = \frac{p - mc_i}{p} \cdot |\varepsilon|$$

$$s_1 = \frac{30 - 6}{30} \cdot |\varepsilon| = \frac{4}{5}|\varepsilon|$$

$$s_2 = \frac{30 - 12}{30} \cdot |\varepsilon| = \frac{3}{5}|\varepsilon|$$

and

$$\varepsilon = -\frac{1}{3} \cdot \frac{30}{14} = -\frac{5}{7}$$

so $s_1 = \frac{4}{5} \cdot \frac{5}{7} = \frac{4}{7}$

and $s_2 = \frac{3}{5} \cdot \frac{5}{7} = \frac{3}{7}$

So $HHI = \sum_{i=1}^{i=N} s_i^2 = \left(\frac{4}{7}\right)^2 + \left(\frac{3}{7}\right)^2 = \frac{25}{49}$

$\frac{25}{49} > \frac{1}{2}$ so it is more monopolistic