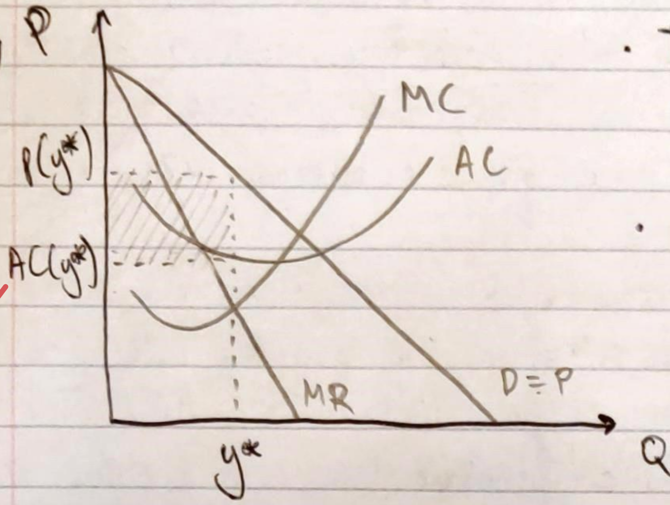
Market power

outstanding

1a) 

- The monopolist's FOC to profit-maximise is still that MR = MC, so they produce output y^*
- However, at this quantity (and all others) the WTP is higher than MR, and the monopolist is able to charge the price given by the inverse demand curve $p(y^*)$

a) Intuitively, MR lies below the demand curve because, since the firm is price-setting, any ~~change~~ increase in its output will reduce the equilibrium price earned for <u>all</u> units sold - i.e. it must lower the price it charges to sell more units and increase revenue, but (in the absence of price discrimination) that forces it to accept a lower price on every unit it sells, meaning MR from additional units is less than the price charged for those units (as that MR also includes a -ve ~~change~~ change in revenue due to lower prices on other units).

Mathematically, note that ~~the FOC with MR = MC can be expressed as~~ ~~$= c'(y)$~~ the monopolist's revenue $R = y\,p(y)$, so $MR := \frac{dR}{dy} = p(y) + y\,p'(y)$. The demand curve, aka $p(y)$ is downward-sloping, so $p'(y) < 0$, and hence $p(y) + y\,p'(y) < p(y)$ i.e. MR < D.

(total or partial derivs?) Doesn't matter since univariate

b) Less elastic PED means the monopolist has greater power. At the extreme of $\varepsilon = -\infty$, we have the perfect competition case: the demand curve is horizontal and equal to MR; the ~~mar~~ firm is a price-taker with no monopoly power. With more inelastic demand, the monopolist can charge a greater markup on its costs in the price. From our definition of MR above, and given that the FOC to profit-max is that MR = MC, we have that $P - MC = -y\,P'(y)$, i.e.

$$\frac{P - MC}{P} = -\frac{\partial P}{\partial y}\frac{y}{P} = \frac{1}{|\varepsilon|}.$$

$\frac{P-MC}{P}$ is the markup, which varies inversely with $|\varepsilon|$.

(though if $|\varepsilon| < 1$ then $MR < 0$ at that quantity, since $MR = p\left[1 - \frac{1}{|\varepsilon|}\right]$. So a monopolist would not operate on the inelastic part of their demand curve, since raising prices would cause ↑ revenues and ↓ costs, since $q\downarrow$ but made up for in revenues by the ~~greater~~ higher price).

c) No, not necessarily. In perfect competion, since firms are price takers, ~~where~~ ~~[illegible]~~ in the long run with free entry/exit, all firms end up ~~[illegible]~~ producing such that $P = AC$. This is because otherwise (if $P > AC$) more firms would enter, pushing down the price back to $P = AC$ with 0 profits. In monopolies, though, there is no LR competition from other firms, so there is not an incentive to have to operate at the minimum of AC curve; they need only ensure $MR = MC$ to profit-max. [but wouldn't their profits be higher if they ~~[illegible]~~ could reduce costs?]

d) DWL is the total value of the forgone surplus due to the monopolist producing less of a good than is ~~the~~ allocatively efficient.
It's the ~~sum~~ aggregate of the lost producer and consumer surpluses for each non-traded unity which would have $MC(y) < P(y)$, i.e. the ~~sum~~ of $WTP(y) - WTA(y)$ for each y^{th} unit above ~~[illegible]~~ the monopolist's selected output y^* s.t. $WTP(y) > WTA(y)$.

3a) Consider firm ①. It wants to $\max_{y_1} \pi_1(y_1, y_2) = p(y_1, y_2)y_1 - c(y_1)$ for which the first-order condition is $\frac{\partial \pi}{\partial y_1} = 0$

i.e. $p(y_1, y_2) + p'(y_1, y_2)y_1 = c'(y_1)$ $\qquad MR = MC$

and we are given that $MC = c'(y_1) = 12$; $p = 72 - 3(y_1 + y_2)$ $\therefore \frac{\partial p}{\partial y_1} = -3$
so $(72 - 3y_1 - 3y_2) + (-3y_1) = 12$, and since both firms have the same technology and MC, $y_1 = y_2 \Rightarrow y_1 = \frac{60}{9} = \frac{20}{3} = y_2$ equilibrium output.

- ~~Price~~ Industry output $= \frac{40}{3}$; price $= 72 - 3(\frac{40}{3}) = 32$
- $\pi_1 = \pi_2 = 32 \times \frac{20}{3} - 12 \times \frac{20}{3} = \frac{400}{3}$. Industry profits $\pi = \frac{800}{3}$

b) The equation states that $\frac{p - MC_i}{p} = \frac{s_i}{|\varepsilon|}$ for each firm i, where s_i is that firm's market share.

For $i = 1$ (and symmetrically 2), $\frac{p - MC_i}{p} = \frac{32-12}{12} = \frac{5}{3}$ ← seems wrong, it can't be >1 I thought!
And since $s_i = 0.5$ for each firm, then $\cancel{\frac{1}{|\varepsilon|} = \frac{10}{3}}$, so $\varepsilon = -\frac{3}{10}$
as $\varepsilon < 0$ given downward-sloping demand curves.
But this doesn't make sense; price-setters wouldn't ever operate on the inelastic part of their demand curve as $MR < 0$ there. (profits increase by raising prices some amount δ)
Except evaluating $MR_1|_{y_1 = \frac{20}{3}} = 72 - 3(y_1 + y_2) - 3y_1 = 12 > 0$. $(= MC)$. Hmm.

Re-calculate $|\varepsilon| = \frac{4}{5}$ here

c) $HHI = \sum_{i=1}^{N} s_i^2 = 0.5$. A smaller HHI means the industry looks more like perfect competition, as each firm has less market share. $0 < HHI \leq 1$ and here it is 0.5 as there are two equally-sized firms competing, with a duopolistic (i.e. fairly monopoly-like) outcome.

$\frac{1}{HHI} = 2$ "effective" firms in the market.

d) Again 1 tries to $\max_{y_1} \pi_1(y_1, y_2) = p(y_1, y_2)y_1 - c(y_1)$

which is achieved with FOC $\frac{\partial \pi_1}{\partial y_1} = 0$ i.e. $\frac{\partial p}{\partial y_1} y_1 + p(y_1, y_2) = \frac{\partial c}{\partial y_1}$ $MR = MC$

so $(-3)y_1 + (72 - 3y_1 - 3y_2) = 6$ since now $c_1(y_1) = 6y_1$
$\therefore y_1 = 11 - \frac{1}{2}y_2$ — call this $r_1(y_2)$

And for firm 2, their optimality condition is as before:
$(-3)y_2 + (72 - 3y_1 - 3y_2) = 12$
$\therefore y_2 = 10 - \frac{1}{2}y_1$ — call this $r_2(y_1)$

- At the NE (y_1^*, y_2^*), each firm produces the best-response output to the actual quantity outputted by their competitor.
- So $y_1 = 11 - \frac{1}{2}(10 - \frac{1}{2}y_1)$ and solving ~~simultaneously~~ for $\frac{3}{2}y_1 = 12$, $y_1 = 8$ and by substitution $y_2 = 6$. Industry output $= 14 > \frac{40}{3}$, price $= 30 < 32$. $\pi_1 = 8 \times (30 - 6) = 192 > \frac{400}{3}$, $\pi_2 = 6 \times (30 - 12) = 108 < \frac{400}{3}$
- Industry profits $\pi = 300 > \frac{800}{3}$. So even though price is lower, total profits are larger since 1 makes far bigger profits (and can charge a bigger markup).
- $HHI = \frac{6^2 + 8^2}{14^2} = 0.51$, so the industry is now slightly more concentrated and monopoly-like.