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Monopoly

A market with only one seller for the good.

↳ Monopolist has the entire mkt power & mkt share.

↳ Only the monopolist caters to the entire mkt demand.

(Mkt demand = Firm demand)

Let Mkt demand curve: $P = P(q)$, $P' < 0$.

& cost fn of the firm: $C = C(q)$, $C' > 0$.

Optimization behavior $\Rightarrow \pi$-max.

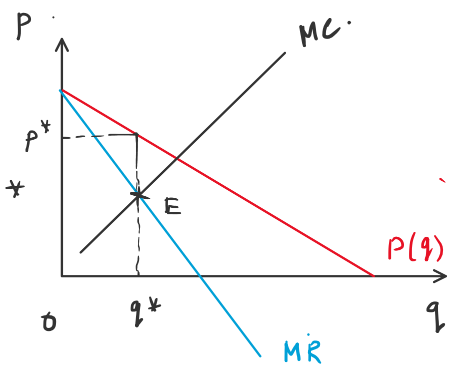
$$\pi = R - C = P \cdot q - C = \overbrace{P(q)}\cdot q - C(q).$$

↳ Price is not a parameter to the monopolist.

$$\Rightarrow \pi = R(q) - C(q)$$

For max: $\dfrac{\partial \pi}{\partial q} = 0 \Rightarrow \left(\dfrac{\partial R}{\partial q}\right) - \dfrac{\partial C}{\partial q} = 0$.

$$\Rightarrow \boxed{MR = MC} \Rightarrow \text{Opt. output } q^*$$



Mkt demand: $P = P(q)$

Put $q = q^*$: $P^* = P^*(q^*)$ $\Rightarrow$ opt. price that can be charged by the monopolist.

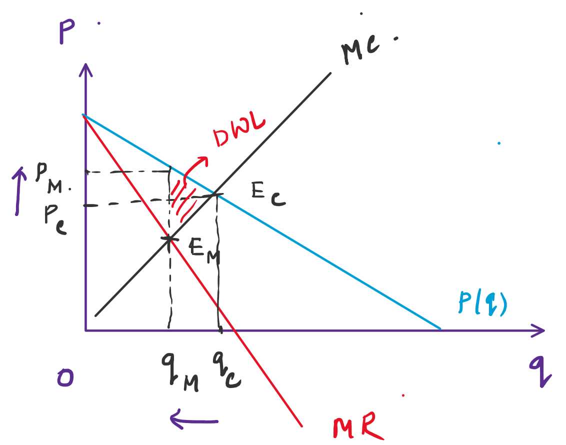
Difference b/w Monopolist Equi & Comp Firm Equillibrium:-

Opt. condition for monopolist: $MR = MC$.

Opt. condition for comp firm: $\boxed{P = MC}$.

Under monopoly, the firm produces lesser output & charges a higher price (indicator of its mkt power).

and this leads to a deadweight loss for society: $DWL = \displaystyle\int^{q_c} P(q)\,dq - \int^{q_c} MC(q) \cdot dq$



q_M q_M

$$= \int_{q_M}^{q_L} [P(q) - MC(q)]\, dq.$$

Q. A monopolist faces mkt demand: $P(q) = 50 - 2q$ and $C(q) = 20 + 2q + 0.5q^2$. Find π-max output & price for the monopolist.

$$\pi = R - C = P(q)\cdot q - C(q) = (50 - 2q)q - (20 + 2q + 0.5q^2)$$

For max: $\dfrac{\partial \pi}{\partial q} = 0 \Rightarrow \quad q^* = \dfrac{48}{5} = 9.6.$

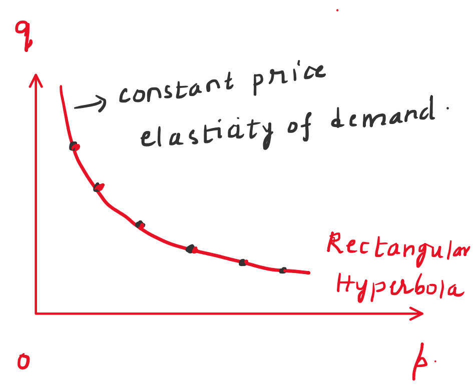
$$p^* = 50 - 2(9.6) = 30.8.$$

Q. Monopolist faces mkt demand: $q = 10p^{-1}$ and $C(q) = 5q$. Find the π-max output.

Revenue costant.

$$\pi = R - C = p\cdot q - C = \cancel{p}\cdot\frac{10}{\cancel{p}} - 5q = (\boxed{10} - 5q)$$

For max: $\dfrac{\partial \pi}{\partial q} = 0 \Rightarrow -5 = 0$



In general, rectangular hyperbola dd curve: $q = Ap^{-\epsilon}, \quad \epsilon > 0.$

$$\text{elasticity of dd} = \frac{\%\Delta q}{\%\Delta p} = \frac{dq/q}{dp/p} = \frac{d[\ln q]}{d[\ln p]}.$$

Taking log: $\log q = \log A - \epsilon \log p.$

Diff: $d[\log q] = -\epsilon \cdot d[\log p].$

$$-\frac{d[\log q]}{d[\log p]} = \epsilon.$$

$a[\log p]$

↳ Abs elasticity of demand.

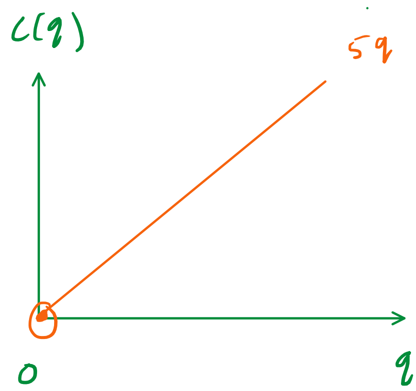
$q = 10p^{-1}$ $\quad$ $C(q) = 5q$

$R = p \cdot q = 10$ [output does not affect revenue].

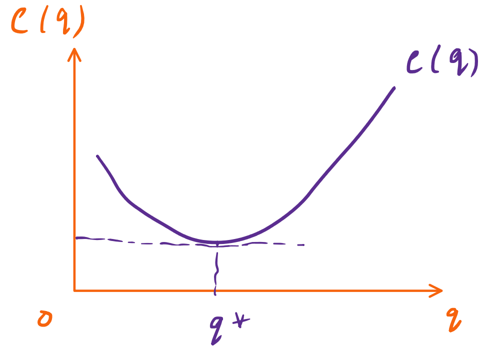
To max $\pi \Rightarrow$ we need to minimize cost.

Minimize $C(q) = 5q$.

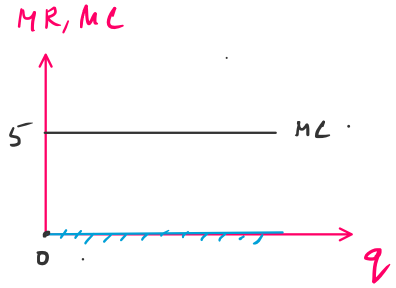
Opt $\Rightarrow q = 0$.



Note: Opt condition $-5 = 0$ does not indicate opt output will be zero. It is the nature of the cost fn that determines q^*.



$MR = 0, \; MC = 5$



HW.

Q. $q = p^{-1/2}$ and $C(q) = 2q$. Find the π-max output.