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AR, MR and |ep| in monopoly:

$\underline{TR = P \times Q}$ — (1) (both P and Q variables).

$MR = \frac{\partial TR}{\partial Q} = P + Q \cdot \frac{\partial P}{\partial Q}$ — (2)

$AR = P(Q)$ — (3)

↳ AR ⇒ demand curve shows inverse relation.

What is the relation between AR, MR |ep|.

eq (2)

$$MR = P + Q \cdot \frac{\partial P}{\partial Q}$$

$$MR = P\left[1 + \frac{Q}{P} \cdot \frac{\partial P}{\partial Q}\right]$$

$$MR = P\left[1 - \frac{1}{-\frac{P}{Q} \cdot \frac{\partial Q}{\partial P}}\right]$$

$$MR = P\left[1 - \frac{1}{|ep|}\right]$$

$$\boxed{MR = AR\left[1 - 1/|ep|\right]}$$

Let us take a linear demand curve,

$P = a - bQ$

↑ a: max willingness to pay

↳ slope, $\frac{\partial P}{\partial Q} = -b < 0$

P is the AR curve with intercept a and slope = -b.

Now, $TR = P \times Q = (a - bQ)Q = \boxed{aQ - bQ^2}$ TC

slope is $\frac{\partial TR}{\partial Q} = a - 2bQ = MR$

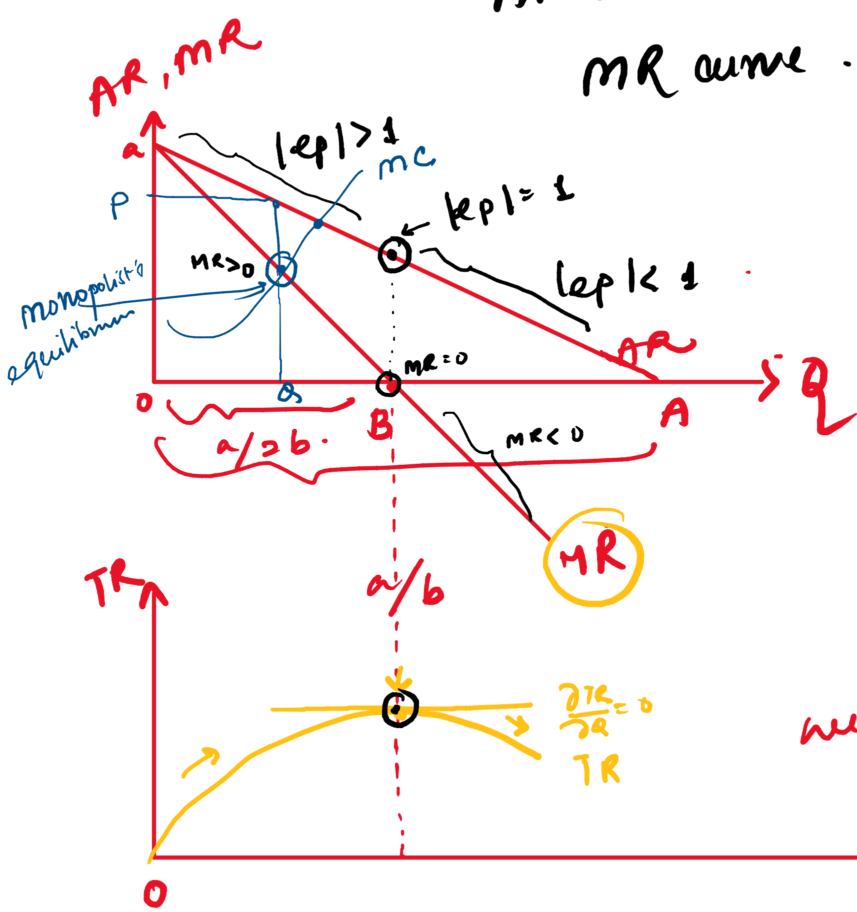
slope of TR is $\frac{\partial TR}{\partial Q} = a - 2bQ = MR$

a ↓ intercept of MR

$-2bQ$ ⟶ slope of MR is $\frac{\partial MR}{\partial Q} = -2b$

∴ |slope of AR| < |slope of MR|
$b < 2b$

∴ AR and MR both starts from the point of intercept 'a' and is a downward sloping straight line.
AR curve will always lie above the MR curve.



$\boxed{OB = \frac{1}{2} OA}$

AR is $P = a - bQ$

$bQ = a - P$

$Q = \frac{a}{b} - \frac{P}{b}$

if $P = 0$, then $Q = \frac{a}{b}$

i.e. $OA = a/b$

we have $MR = a - 2bQ$

$2bQ = a - MR$

$Q = \frac{a}{2b} - \frac{MR}{2b}$

$MR = 0 \Rightarrow Q = a/2b = \frac{1}{2}$ of AR.

$MR = AR\left[1 - \frac{1}{|ep|}\right]$

$MR = AR\left[1 - \frac{1}{|ep|}\right]$

$MR = 0 \Rightarrow Q = a/2b = \frac{1}{2}$ of AR.

① AR is inelastic ie $|ep| < 1$ $\Rightarrow MR < 0$
$\Rightarrow$ TR is falling with increase in Q. X

② AR is elastic ie $|ep| > 1$ $\Rightarrow$ ~~AR~~ $MR > 0$
$\Rightarrow$ TR is rising at decreasing rate

③ AR is unit elastic ie $|ep| = 1$
$\Rightarrow MR = 0$
$\Rightarrow$ TR is at max.

A monopolist will always produce at the elastic portion of the AR curve or MC curve will always pass through the elastic portion of the AR curve.

Monopoly power $\Rightarrow$ Lerner's Index.

$$L = \frac{P - MC}{P}$$

as $P > MC \Rightarrow L$ increases $\Rightarrow$ monopoly power

ex if $\boxed{P = MC} \Rightarrow L = 0 \Rightarrow 0$ monopoly power
(case of Perfect competition)

$MR = AR\left[1 - \frac{1}{|ep|}\right]$

In equil, $MR = MC$

In equil, $MR = MC$

$$MR = P\left[1 - \frac{1}{|ep|}\right]$$

$$L = \frac{P - MR}{P}$$

$$L = \frac{P - P\left[1 - 1/|ep|\right]}{P}$$

$$L = \cancel{1} - \cancel{1} + 1/|ep|$$

$$\boxed{L = \frac{1}{|ep|}}$$

ie there is inverse relation between the monopoly power & the elasticity of demand.

ie a market with higher price elasticity of demand will have lower monopoly power & vice versa.

for ex: In a PC market the demand curve is perfectly elastic ie, $|ep| \to \infty$ and $L \to 0$

— * —

<u>when price discrimination is profitable</u>

Two segments → M_1 and M_2

M_1	M_2
✓ P_1	✓ P_2
✓ MR_1	✓ MR_2

In M_1:

In M_1:

$MR_1 = P_1\left[1 - \frac{1}{|e_1|}\right]$

In M_2:

$MR_2 = P_2\left[1 - \frac{1}{|e_2|}\right]$

✓ MR_1
✓ $|e_1|$

✓ MR_2
✓ $|e_2|$

In equil $\boxed{MR_1 = MR_2 = MC}$.

if $MR_1 = MR_2$

$P_1\left(1 - \frac{1}{|e_1|}\right) = P_2\left(1 - \frac{1}{|e_2|}\right)$

$\frac{P_1}{P_2} = \left[\frac{1 - 1/|e_2|}{1 - 1/|e_1|}\right]$

If $\boxed{P_1 < P_2}$

$\frac{P_1}{P_2} < 1$

$\frac{1 - 1/e_2}{1 - 1/e_1} < 1$

$1 - \frac{1}{|e_2|} < 1 - \frac{1}{|e_1|}$

$\boxed{|e_1| > |e_2|}$

if $P_1 = P_2$ then it requires $|e_1| = |e_2|$

No price discrimination.

Q A firm faces the following average revenue (demand) curve:

$P = 120 - 0.02Q$

$TR = PQ = 120Q - 0.02Q^2$

$$P = 120 - 0.02Q$$

$$TR = PQ = 120Q - 0.02Q^2$$

The firm's cost fn is $C = 60Q + 2500$.

Assume that the firm maximises profit

(i) What is the level of prod, price and total profit

$$MR = MC$$

$$120 - 0.04Q = 60$$

$$Q = 1500 \qquad \therefore P = 90$$

$$\pi = TR - TC$$

(e) If govt decides to levy a tax of 14 cents per unit on this product, what will be the new level of production, price & profit.

$$P^* + T = 120 - 0.02Q$$

$$P^* = 120 - 0.02Q - T$$

$$MR^* = 120 - 0.04Q - T$$

$$MR^* = MC$$

$$120 - 0.04Q - 14 = 60$$

$MR = MC$

$120 - 0.04Q - 14 = 60$

$Q = 1150.$