

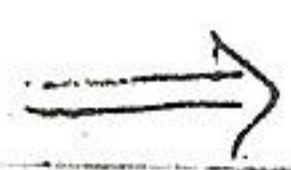
change in price and as a result, I will lose a significant share in the market. Put differently, a rise in price will decrease revenue suggesting that demand is elastic for an upward change in price.

The variation in elasticity of demand causes a kink in the demand curve at the existing price of  $P$ . The producer realizes that the best strategy is to leave price unchanged. The two different segments of demand curve are linear and therefore the <sup>corresponding</sup> marginal revenue functions will intersect at point A which can be taken up to the demand curve to get point B. The vertical range AB in marginal revenue reinforces our conclusion by suggesting that even if MC increases from  $MC_1$  to  $MC_2$  and eventually to  $MC_3$ , producers will be too scared to increase price and they will absorb the rise in cost of production into their profits. Price sticking stickiness in the market also makes kinked demand curve model known as "sticky-price theory". One of the major limitations of kinked demand curve model is that it only explains what will happen in the market once price of OP is determined. It fails to explain the dynamics which determine the price of OP in the market. Secondly, long run changes in market are not accounted for which makes it more applicable in the short run. But despite these limitations the outcome of kinked-demand curve theory is significant.

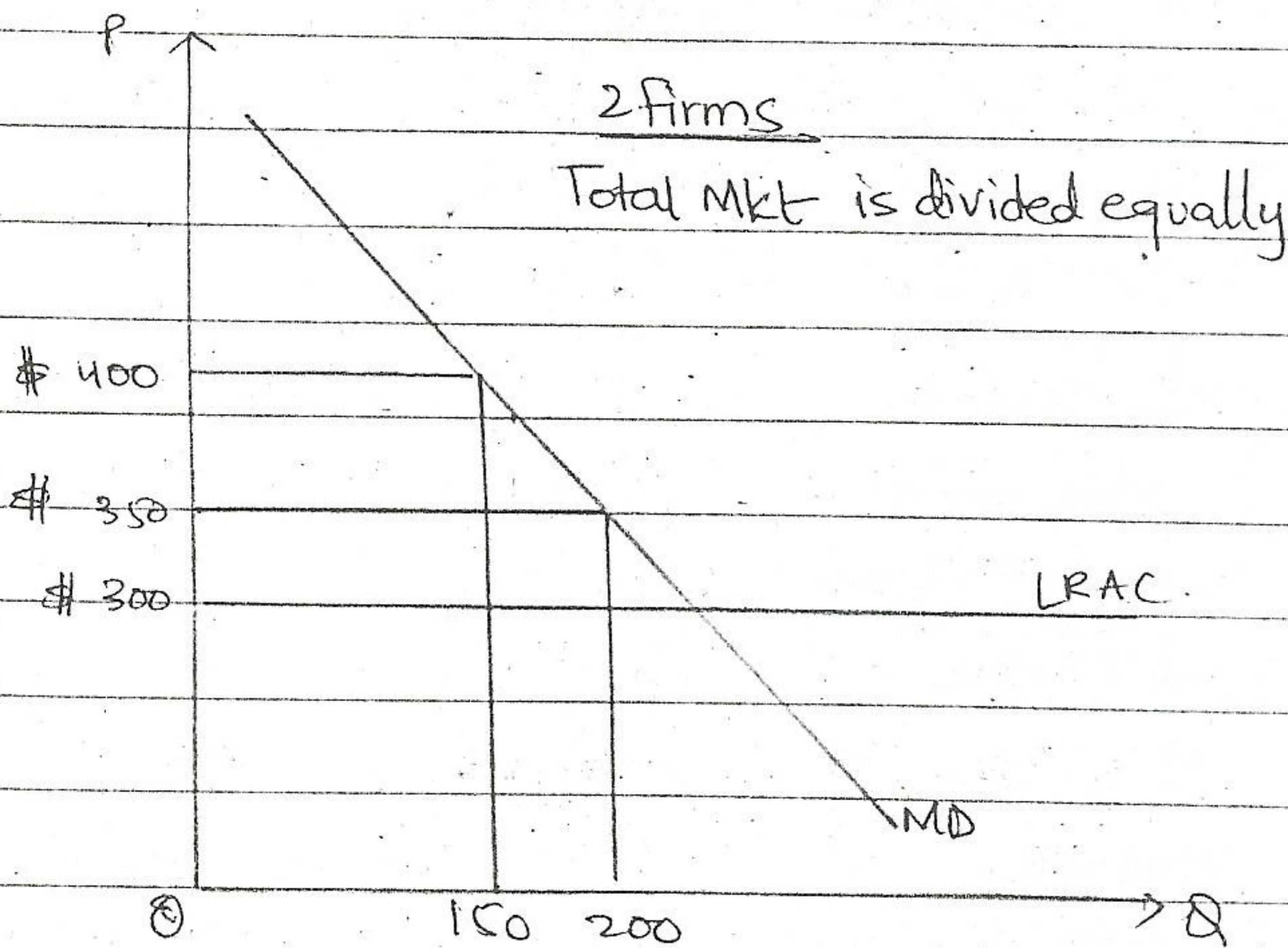


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which is that even with two firms in the market, the outcome for consumers can be competitive as long as there is no collusion.



## Game Theory



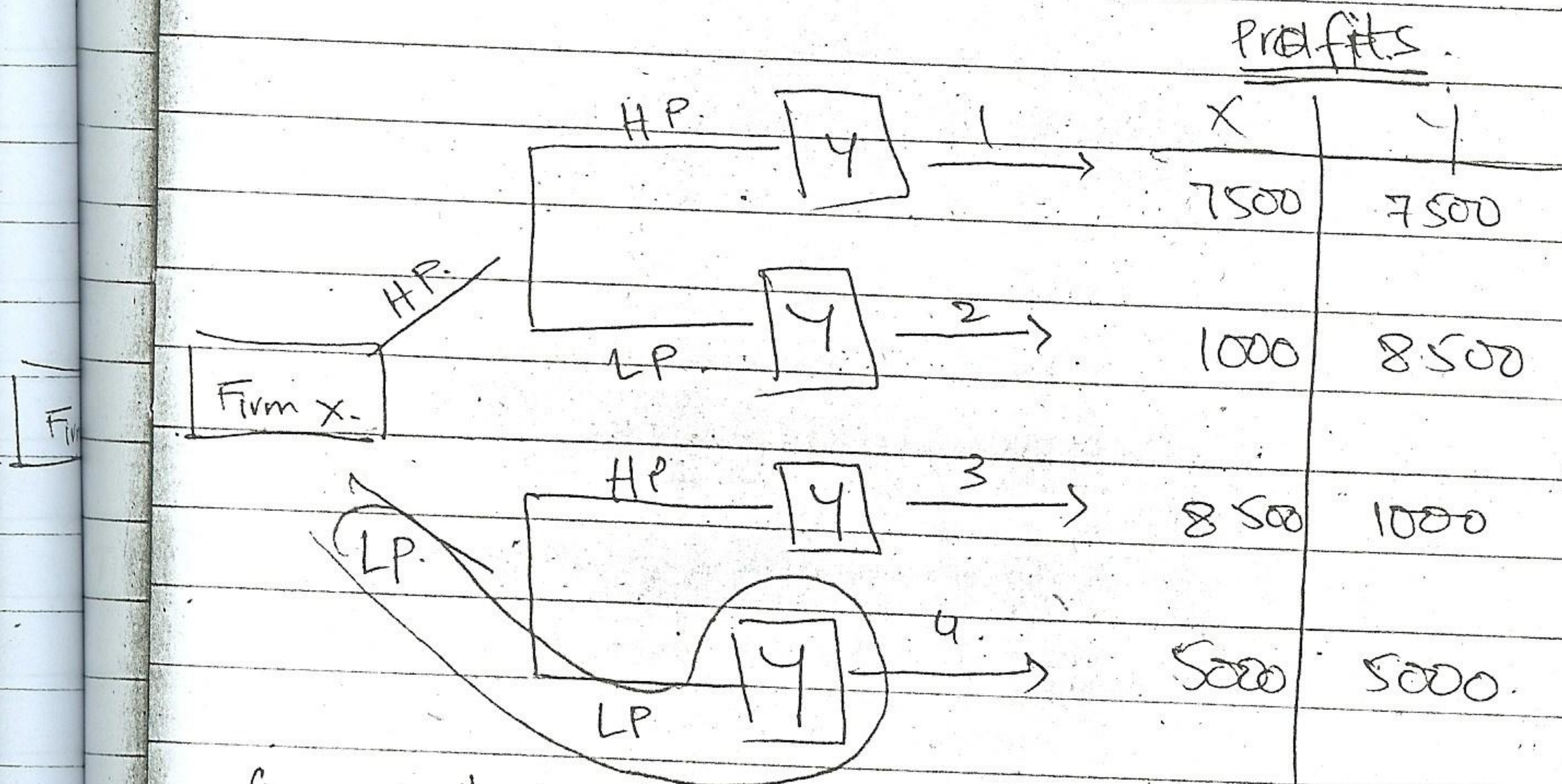
When both firms charge \$350

When both firms charge \$400

When firm (X) charges \$400 & Y charges \$350

	X	Y		X	Y		X	Y
Price	\$350	\$350		\$400	\$400		\$400	\$350
Output	100	100		75	75		10	170
Profit Percent <small>unit</small>	50	50		100	100		\$100	50
Total Profit	\$5000	\$5000		7500	7500		\$1000	\$8500





(non-collusive oligopoly)

The decision tree above can be analysed as follows:

- ① If firm X goes for HP strategy then firm 'Y' will respond with LP strategy as that will help firm Y take the entire market away from firm X. This eliminates option 1 i.e. firm Y responding with HP strategy.
- ② If firm X goes for LP strategy then firm Y will respond with the same otherwise it will lose the entire market to X. This eliminates option ③ that i.e. firm Y responding with HP strategy.
- ③ Firm X knows that regardless of its own strategy it will always pay firm Y to respond with a LP strategy. This eliminates option no. 2 and makes option 4 the dominant strategy. In other



⇒ Monopoly,

words despite the fact that there are only 2 firms in the mkt and they can exploit consumers by charging high prices, the outcome is still competitive b/c each firm will end up charging a low price. This phenomenon is known as Nash equilibrium.

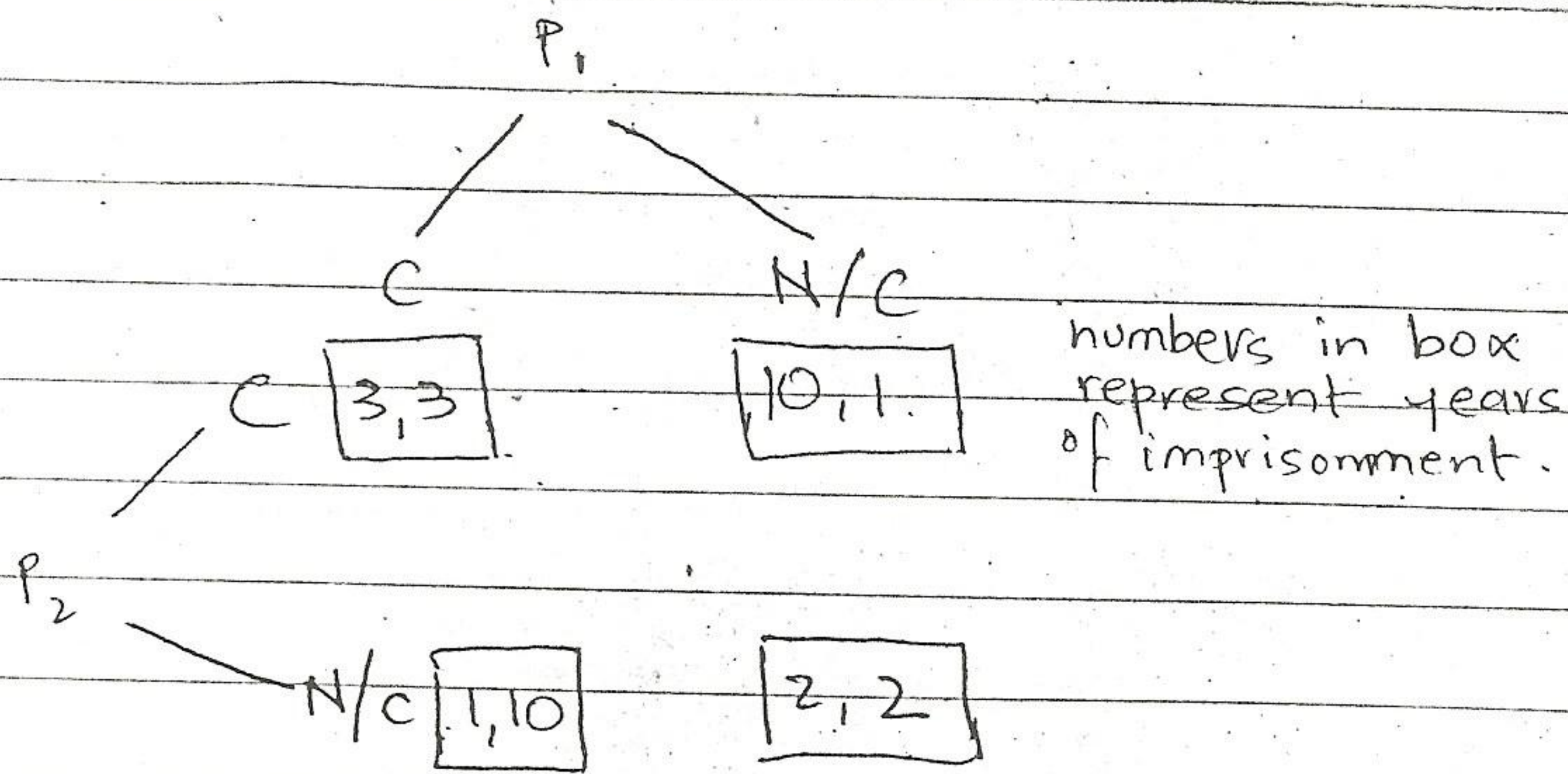
⇒ Prisoner's dilemma.

Prisoner's dilemma is another manifestation of non-cooperative duopoly. The theory of prisoner's dilemma can be explained as follows:

"A police officer catches two criminals who are being charged for a minor theft. During the course of interrogation he begins to suspect them of committing a much bigger offense for which there is no evidence unless prisoners confess. As a strategy the police officer separates them and puts him into two different cells so that they cannot communicate with each other and he gives each one of them the following options:

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- ① If you confess and your partner doesn't then you will get one year in prison while your partner will serve a term of ten years and vice versa.
- ② If both of you confess then each one of you will serve a term of ~~ten~~ three years.
- ③ If both of you do not confess then you will be charged for the minor theft and serve a term of two years.

Assuming that prisoners are guilty of the bigger crime their reaction to these options will be as follows:

- Both of them realize that not confessing is the best option but it gives the incentive to the other party to confess and reduce its term by another year ~~at the~~ at the expense of his partner who will be stuck for 10 years. Given this risk,



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the dominant strategy will be to confess. The  
The two prisoners are two firms in duopoly  
and to confess is synonymous with charging  
a low price while to not confess is similar to  
charging a high price.



## ⇒ Monopoly

Monopoly occurs when market is dominated by a single producer. Technically a firm which has obtained more than 45% of the  $p$  mkt is classified as monopoly. Monopolies can be created in different ways. For example a public monopoly is created by the govt when it controls a particular sector and private firms are not allowed to compete with government. For example in the UK British rail, British telephone, British gas were all public monopolies before de-regulation & privatisation in mid 1980s and early 1990s. Similarly sometimes size of the market is so small that it will allow only one firm to produce efficiently given the total level of investment required. For example if the minimum efficient scale as a percentage of national sales is 50%, it implies that market can only accommodate two ~~firm~~ firms ( $\frac{100}{50}$ ). If it rises above 50% than mkt

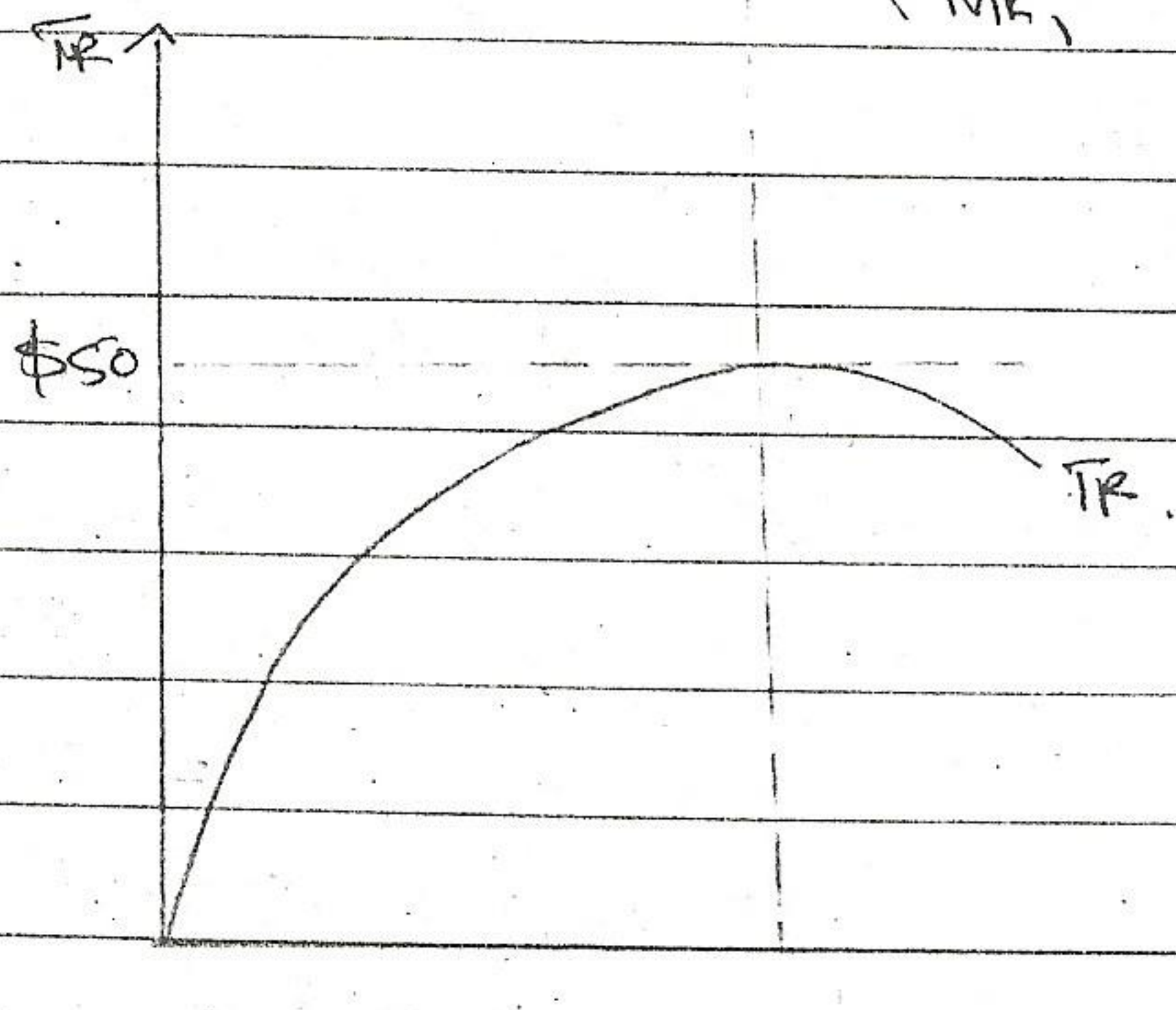
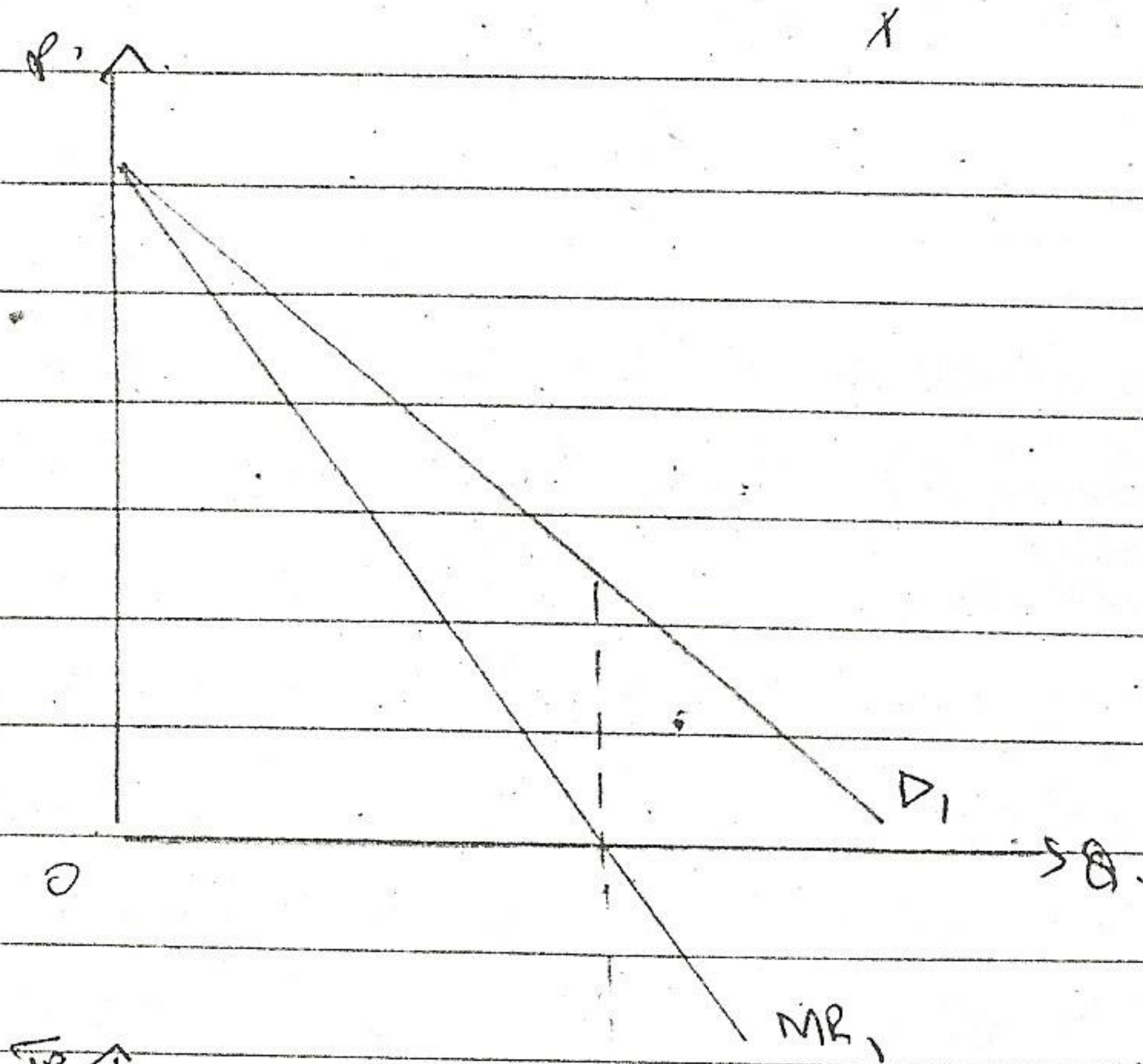
will automatically turn into a monopoly. Finally, sometimes monopolies are created through special licences and franchise agreements where a single producer or a distributor is allowed to serve the market and other firms cannot compete. ~~For~~ For eg in Pakistan only one firm is allowed to provide satellite phone services b/c it has an exclusive



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franchise agreement with a foreign satellite company called thuraya.

Unlike a perfect competitor who is a price taker, a monopolist is known as the a price maker. However he does not have control over both price and quantity because he faces a downward sloping demand curve.





P	Q	TR	MR
20	0	0	
18	1	18	-18
16	2	32	-14
14	3	42	-10
12	4	48	-6
10	5	50	-2
8	6	48	(-2)
6	7	42	(-6)

The downward sloping demand curve also has a downward sloping MR function whose slope is half the slope of Demand function. MR is decreasing b/c for every additional unit sold monopolist lowers the price which not only applies to the additional unit but also to the preceding unit. These units could have been sold at a higher price & therefore monopolists will lose revenue on them. Thus, the change in Total revenue becomes the difference b/w revenue earned <sup>on the</sup> from additional unit & revenue lost on the preceding units. As long as MR is positive we can say that gain in revenue outweighs the loss and when MR becomes negative its the loss which outweighs the gain. Furthermore, since TR is a product of P & Q we could say if fall in price increases revenue, not only MR



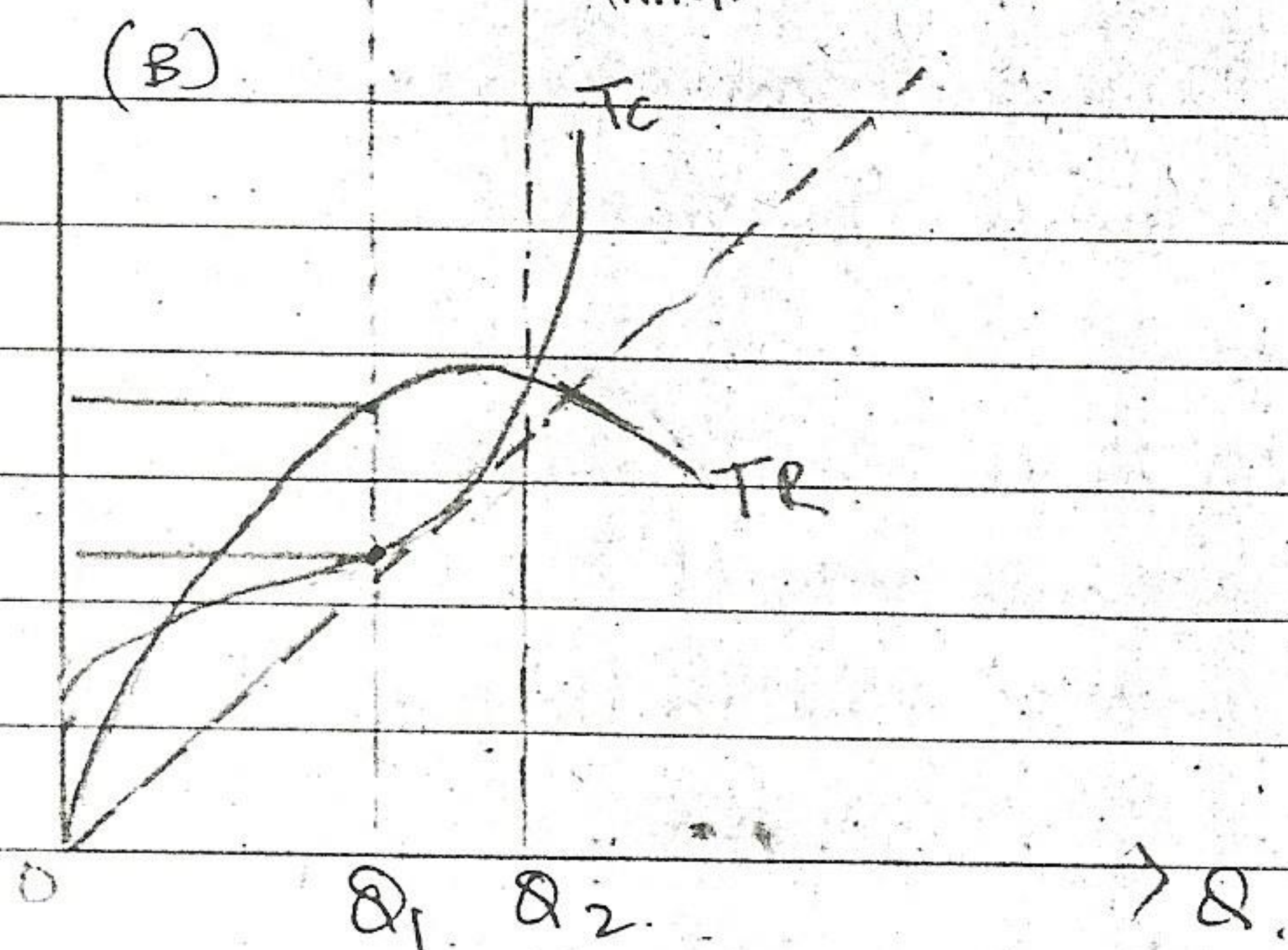
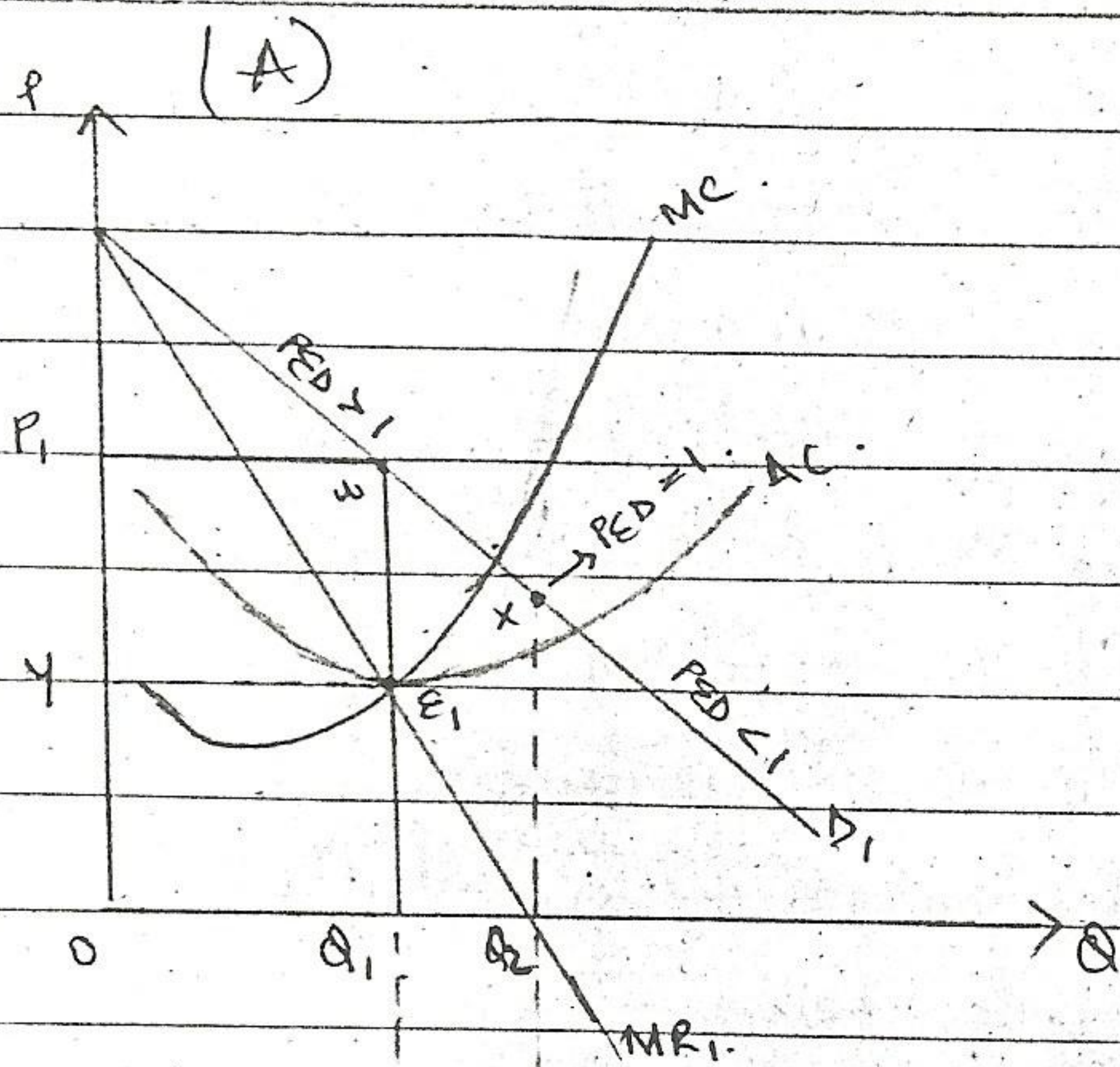
will be positive but PED will also be more than one. Similarly if fall in price decreases total revenue then MR will be negative and PED will be less than one. From these two extremes it follows that if change in price leaves TR unchanged then MR will be zero and PED will be equal to one.

So the point where MR cuts the x-axis can be extended to the demand curve and at that point PED will be equal to one. All points to the left of it PED will be greater than 1 while all points to the right of it PED will be less than one.

$$\downarrow P \times Q \uparrow = TR \quad \begin{array}{l} \xrightarrow{\uparrow (\% \Delta \text{ in } Q > \% \Delta \text{ in } P \therefore PED > 1 - MR +)} \\ \xrightarrow{\Delta TR = 0 \rightarrow (\% \Delta Q = \% \Delta P \therefore PED = 1) \rightarrow MR \text{ is } 0.} \\ \xrightarrow{\downarrow (\% \Delta \text{ in } Q < \% \Delta \text{ in } P \therefore PED < 1 - MR -)} \end{array}$$

A monopolist is a profit maximiser which means that he will always be in equilibrium in the elastic range of the demand curve where fall in price increases total revenue. The profit maximising condition for a monopolist is  $MC = MR$ . The following set of diagram illustrates Profit maximisation in a under monopoly.





A monopolist maximises profit by equating  $MC$  to  $MR$ .  $MC$  is defined as the cost of producing an extra unit while  $MR$  is defined as the addition to total revenue from the extra unit produced. As long as  $MC < MR$  firm will keep increasing output and maintain its equilibrium. In panel A profits are maximised at point  $E_1$  where equilibrium price is equal to  $OP_1$  and equilibrium quantity is equal to  $OQ_1$ .  $TR$  is equal to  $OP_1 WQ_1$  while total cost equals  $OYQ_1$ . Since



TR > TC the difference between these 2 becomes supernormal profits which is the ~~reg~~ rectangle YP, WE, (area). In panel B the supernormal ( $\pi$ ) are shown by the difference b/w TR and TC. TR increases at a decreasing rate as long as the PED > 1 and then reaches the maximum where PED = 1. It is obvious that monopolist being a  $\pi$  maximizer will always maximise profits in the elastic range of the demand curve where fall in price increases TR. So equilibrium output  $Q_1$  must lie to the left of output level  $Q_2$  which corresponds to the maximum point of TR. Furthermore, point  $E_1$  in panel A is also the minimum point in the avg cost curve implying that a ray from the origin must be tangent to TC curve at output level  $Q_1$ . The difference b/w TR and TC in panel B has to be equal to the area of ~~triangle~~ rectangle P, WE, Y. If monopolist maximises profits in the short run then those profits will persist in the LR as well because monopoly is characterised by barriers to entry. These barriers could create monopolies in different ways. For ~~exap~~ example, a public monopoly is created when govt assumes control of a particular sector and does not allow priv sector to compete with it. In many countries public utilities like electricity, gas, water are controlled by the govt and they often happen to be natural monopolies b/c they prevent wasteful duplication of overheads. Secondly, the intensity of fixed costs (fixed capital investment) requires overheads to be spread over



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a larger volume of output so that economies of scale can be passed onto consumers. Another type of monopoly that can be created is through legal barriers which include special licenses, franchise, agreements, patents, copyrights, trademarks, etc. Many pharmaceutical companies which invest a lot of money in RnD protect their drugs from generic duplications through patents and trademarks. The most important drug and at the same time the most controversial is anti-retroviral produced by American companies but their main market is Africa where generic substitutes from India, Thailand and Brazil are violating the patents. Similarly, monopolies are created b/c of limited market size which can turn into 'a barrier to entry'. The following table illustrates, how size of the market can become a barrier to entry and create monopoly.

Industry	minimum efficient scale as a % of national sales.
Bread	1%
Computers	20%
Diesel Engines	80%



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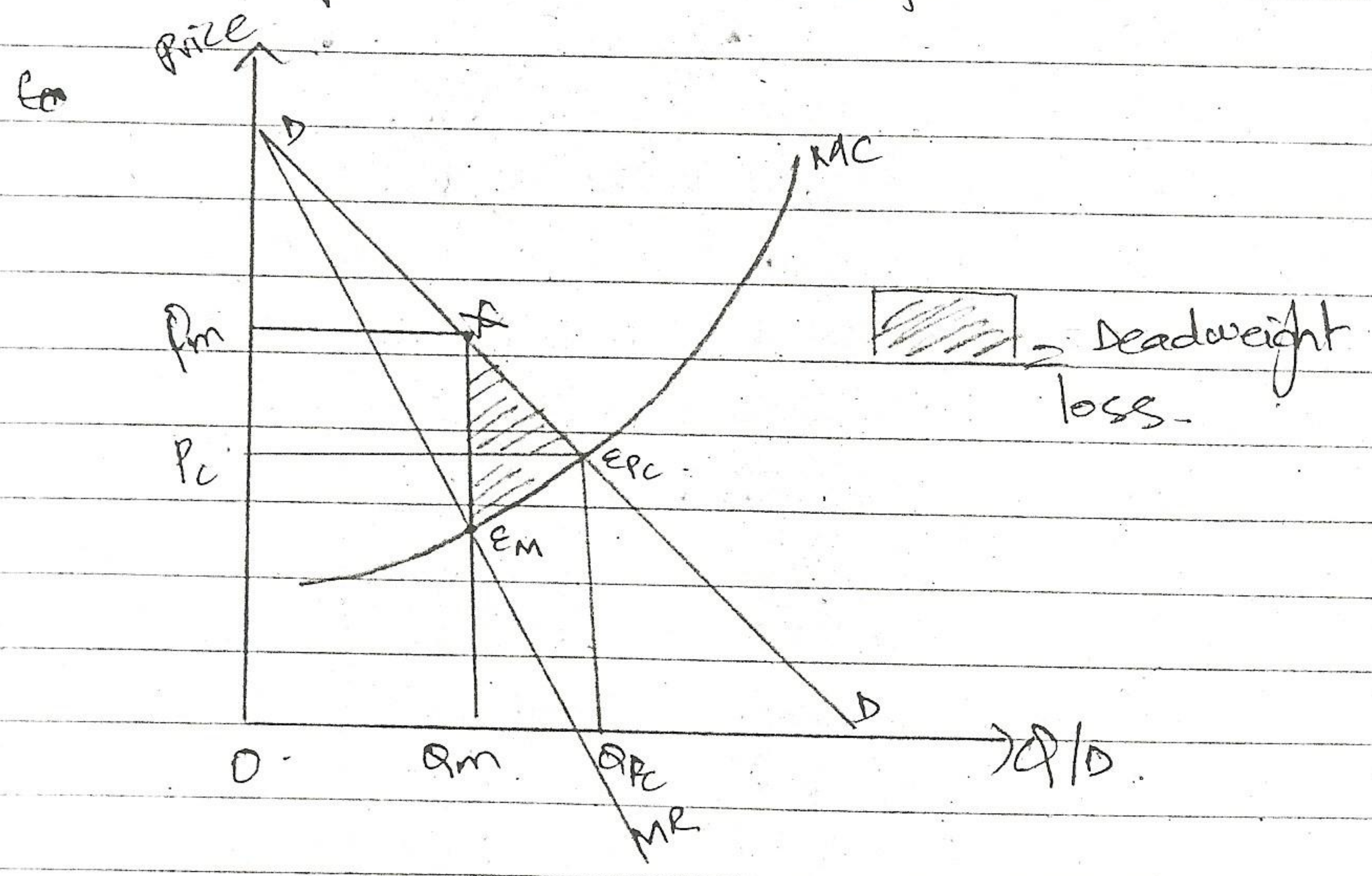
The table above shows that given the size of the market, bread will be produced under ~~consumption~~ condition of monopolistic competition, computers will be produced under ~~of~~ oligopolistic competition as market can only support 5 firms while diesel engines will be an absolute monopoly.

Finally monopoly can also be created through integration for example Debeers in S-A has acquired control over most of the diamond mines which gives it an enormous raw material advantage over its competitors. A, T and T has monopolised on the market by making an exclusive agreement with Apple which allows it to get iPhones locked for its service. Mergers, acquisitions and hostile takeovers are other forms of integration which can create monopolies.



## Comparison of Regular monopoly with Perfect Competition.

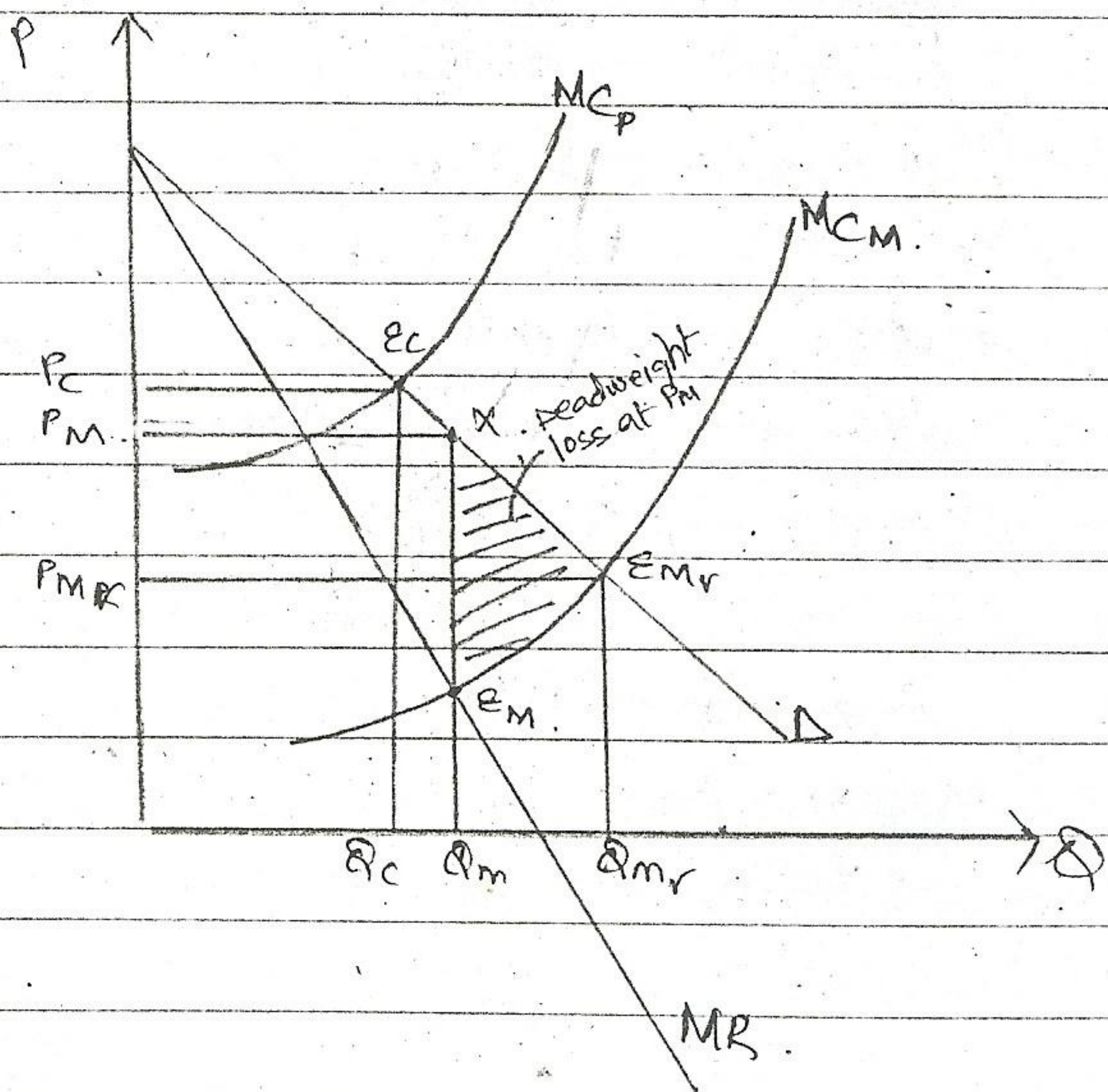
The diagram <sup>below</sup> compares perfect competition with regular monopoly. The monopolist will maximize profit where  $MC = MR$  i.e. at pt ~~EM~~  $E_M$  which results in price of  $OP_M$  and quantity of  $OQ_M$ . In contrast a perfectly competitive industry will equate  $MC$  to price at pt  $E_C$ . This will result in price of  $OP_C$  and quantity of  $OQ_C$ . Furthermore the comparison b/w perfect competition & monopoly shows that monopolist produces less ( $OQ_M < OQ_C$ ) but charges more ( $OP_M > OP_C$ ). The resulting loss of output also creates a dead weight loss which is measured by the shaded triangle  $E_M E_C X$ . This efficiency loss could also be seen as a combined loss of producer surplus and consumer surplus.





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Comparison of natural monopoly with perfect competition:



The diagram above compares perfect competition with a natural monopoly. A natural monopoly is characterized by economies of scale and this is why the MC curve of monopoly ( $MC_m$ ) lies below the MC curve of perfect competition ( $MC_p$ ). The difference in the position of MC curve results in monopoly price being lower than competition price ( $P_m < P_c$ ) and monopoly output being higher than competition output ( $Q_m > Q_c$ ).

Furthermore, this monopoly could be regulated and be made to follow the rule of MC plus pricing which will result in further expansion in output to  $Q_{mr}$  which is regulated monopoly output and reduction in price



to  $P_m$  which is regulated monopoly price.

## ⇒ ⇒ PRICE DISCRIMINATION :

Price discrimination occurs when a firm sells its product at different prices in different market segments and the price differences are not due to differences in cost but due to difference in price: PED. For price discrimination to be successful markets should be separate and it shouldn't be possible to buy from the low price segment and sell in the high price segment. If there is an opportunity of arbitrage like that, then price in the low market segment will begin to increase and price in the high price segment will begin to decrease and the process will continue until prices are equalised in both segments. Price discrimination can be divided into first degree price discrimination, second degree price discrimination and third degree discrimination.

### ⇒ ⇒ First degree price discrimination :

It occurs when a producer is able to sell each unit at its maximum possible price. This is why first degree PD is also referred to as perfect P.D. The diagram (Fig 1) below shows that producer instead of selling all 4 units at a price of \$10 will sell the first unit



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at \$16, 2nd at \$14, 3rd at \$12 and the 4th unit at \$10. This will enable him to eat up the entire consumer surplus. In some cases the ability to perfectly price discriminate can spell the difference between continuing production and shutting down. Figure 2 illustrates this point.

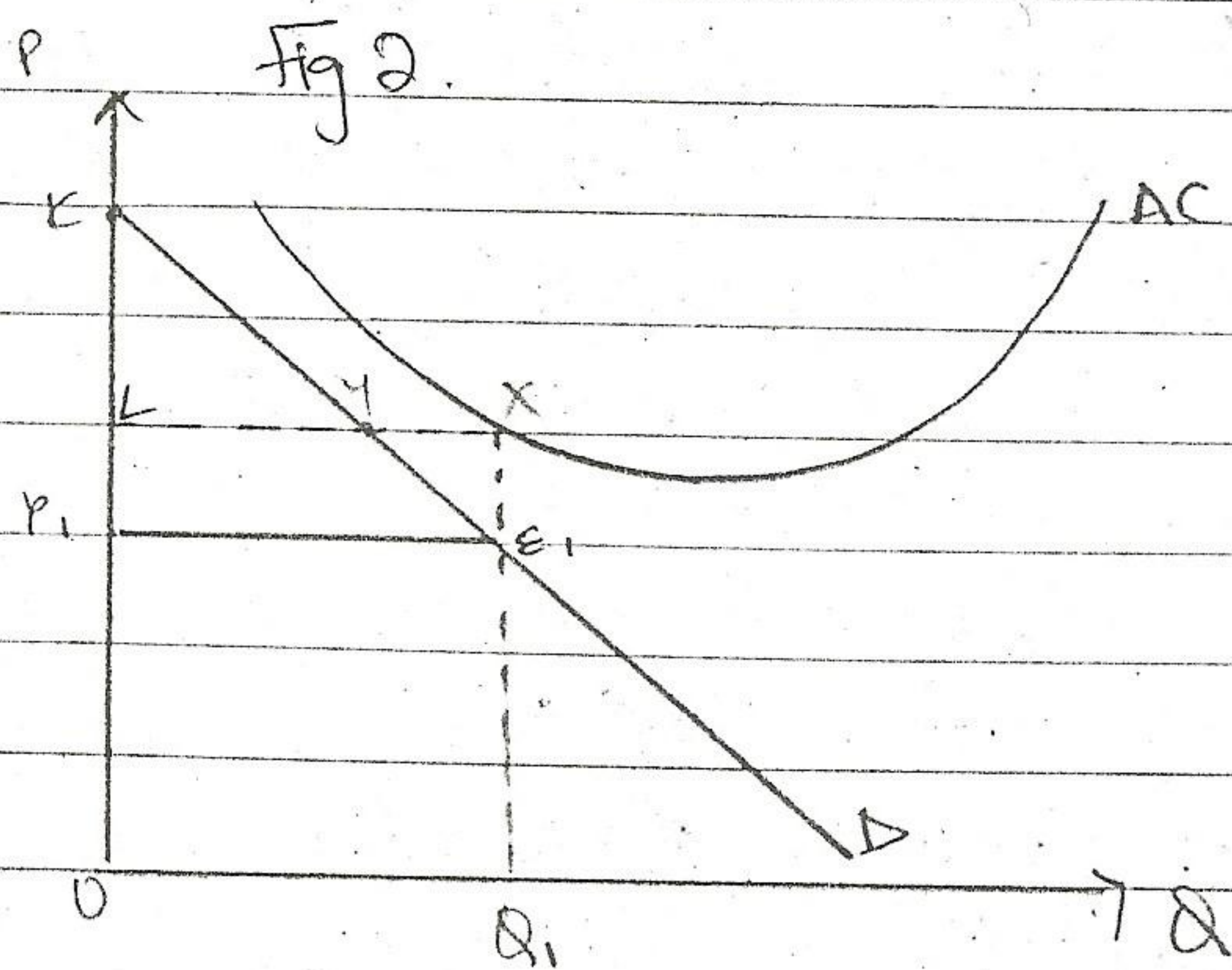
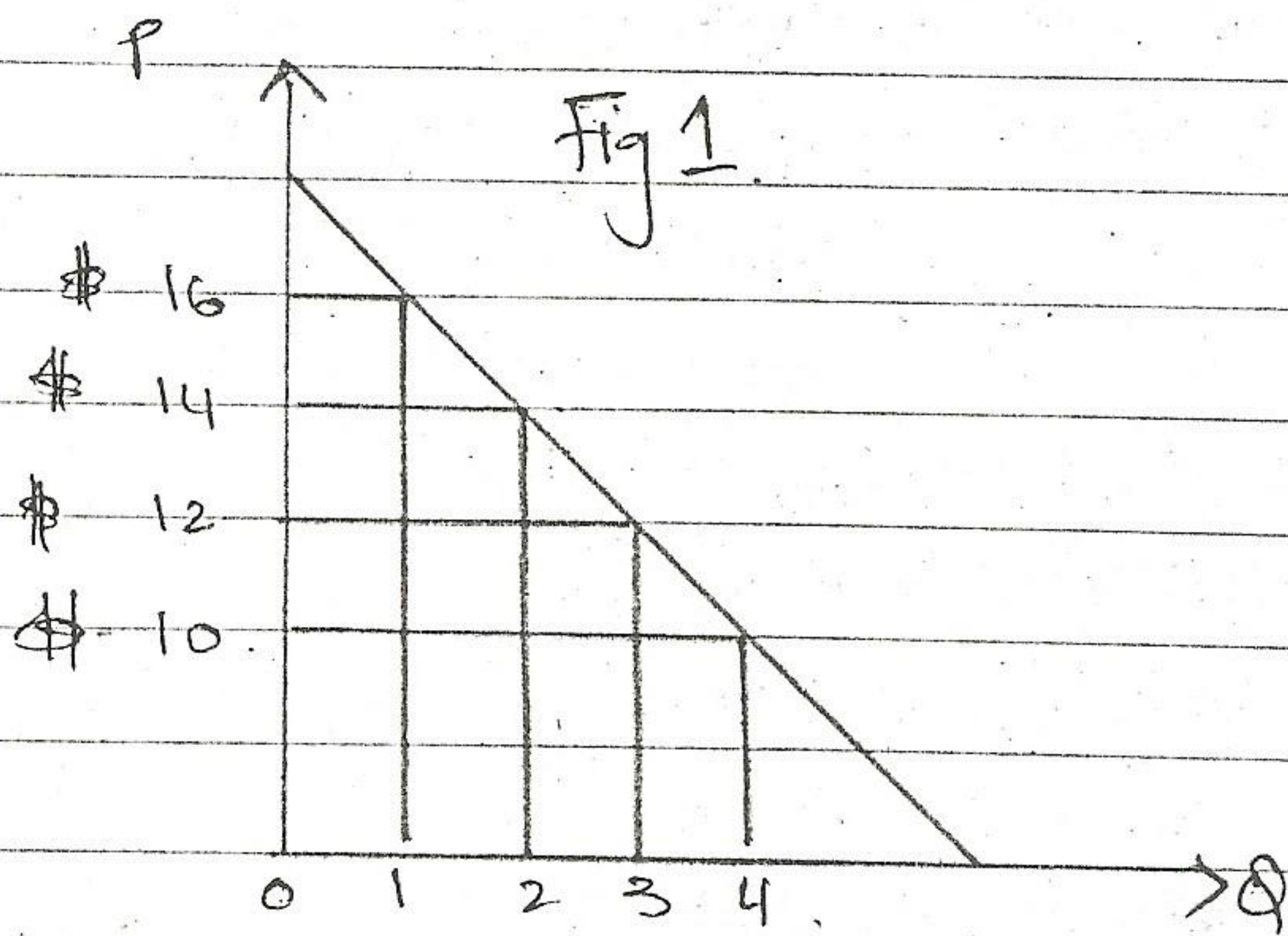




Figure 2 shows that if monopolist was not a price discriminator then producing any output level such as  $Q_1$ , would have resulted in losses since AC curve lies above the demand curve in the entire range of output. Specifically for output level  $Q_1$ , total revenue would be  $OP_1E_1Q_1$ , while TC will be  $OLXQ_1$ , and any subnormal profit/loss would be the rectangle  $LXE_1P_1$ . However, perfect price discrimination will create additional revenue equal to consumer surplus of  $KE_1P_1$ , which would be more than the area of loss, thus converting subnormal profits into supernormal profits equal to  $KLH - YXE_1$ . This will guarantee production in the long run.

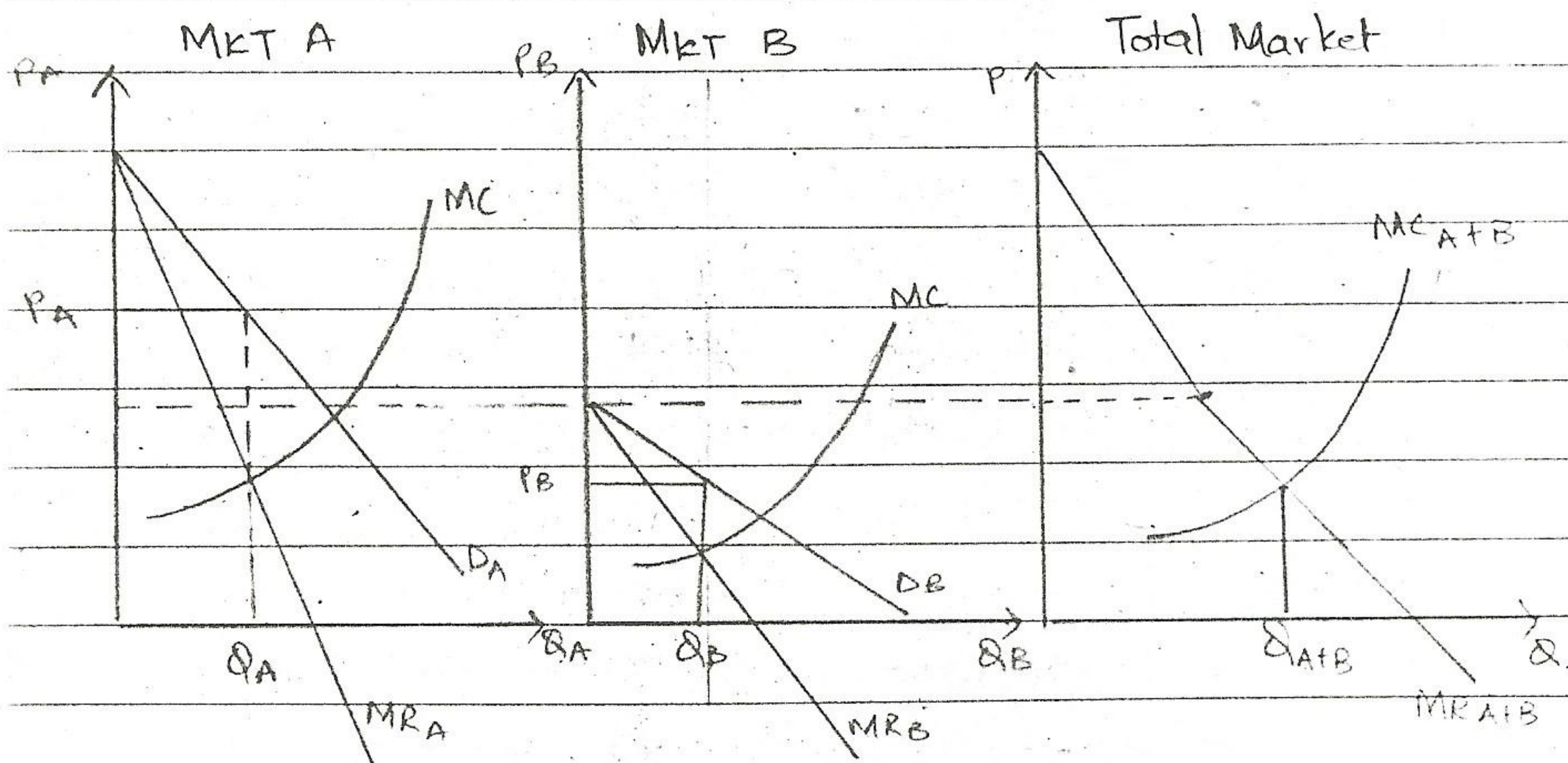
### • Second degree price discrimination

It is also known as consumption based discrimination where price per unit varies inversely or directly with the no. of units consumed. For example in Pakistan, the electricity prices are charged on the basis of consumption and the price per unit of electricity increases progressively with the no. of units consumed so that rich consumers bears some of the burden of poor consumers. Price can also vary inversely with consumption, for example discounts on bulk buying where the higher the quantity bought the lower is the price per unit.



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• Third degree price discrimination :



$$P_A > P_B$$

$$Q_A < Q_B$$

$$PED_A < PED_B$$

The diagram above shows that market is divided into 2 segments A and B. The horizontal line running through all 3 panels is the marginal cost function. The equilibrium in each mkt is determined by the intersection of MC & MR. We can see that in mkt segment A demand is visibly inelastic while in market segment B demand is visibly elastic. This is why intersection of MC with  $MR_A$  results in a higher price & a lower quantity, while in intersection segment B intersection of MC &  $MR_B$  results in a relatively lower price & a higher quantity. The last panel shows aggregation of MR functions and



intersection of MC with  $MR_{A+B}$  determines the total quantity which is  $Q_A + Q_B$ . For this type of price discrimination to be successful the separability of markets is very important, otherwise, the opportunity of arbitrage (buying from low price segment and selling in high price segment) will eventually equate prices in both markets. In case of services there is no threat of arbitrage, for example, if a power company divides its mkt b/w residential and commercial consumers charging them a different price per unit of electricity. However, in case of a tangible good the opportunity will exist and arbitrage will need to be regulated.



## Contestable Market

### LABOUR

In recent years the theory of contestable mkt has been developed by economists. The theory argues that what is important in determining price and output is not whether an industry is a monopoly or perfectly competitive industry but whether there is a real threat of competition.

So an industry which is dominated by a single firm with a lot of monopoly power faces threat of entry then the dominant firm will actually act like a competitive firm and keep price at a level where it does not attract potential entrance. In other words, contestable mkt can be a monopoly situation without any barriers to entry. For example a canteen owner in a school may enjoy absolute monopoly as he faces no competition but he may not act like a monopolist because he realizes that there is a threat of entry and a rival firm could instantly enter and take the monopoly power away. This threat of entry will force him to keep prices and profits at a competitive level.

### ⇒ Perfectly contestable markets:

A market is perfectly contestable when the cost of entry and exit to potential rivals is zero. In such cases, the moment it becomes possible to earn supernormal profits, rival firms will enter the mkt and wipe out all supernormal profits. The following diagram shows how contestable markets work: