



$$(PQ)' = 2000 + 40P$$

$$T.R = 2000P - 20P^2$$

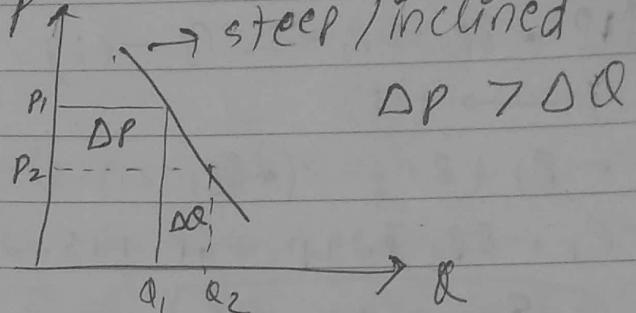
$$T.R = 2000(70) - 20(70)^2$$

$$T.R = 42000$$

$$MR = 2000 - 40(70)$$

$$MR = -800$$

Relatively Inelastic demand curve



~~Ex~~ Education

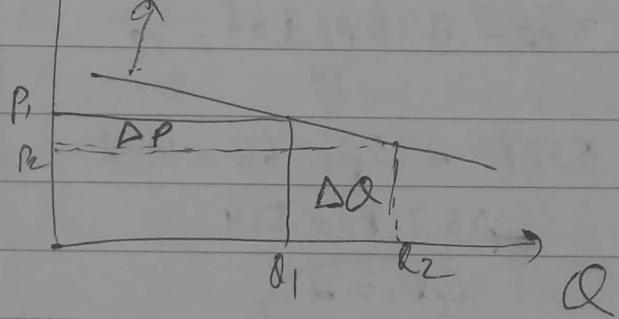
Medical / Hospitals

edibles

opportunity \downarrow choices

\Rightarrow Elastic demand.

P_A flat, $\Delta P < \Delta Q$.



\Rightarrow choices are there.

~~Ex~~

- cell phones
- apparels

Elasticity:

$$Ed = \frac{\% \Delta Q}{\% \Delta P}$$

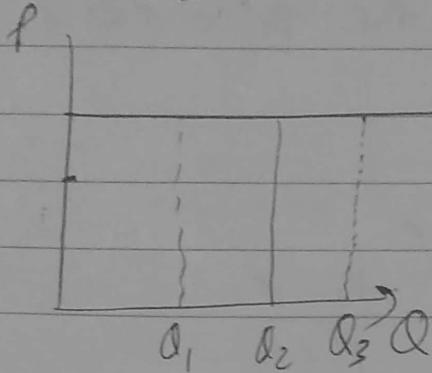
\rightarrow Inelastic demand

\rightarrow elastic demand

\rightarrow perfectly inelastic

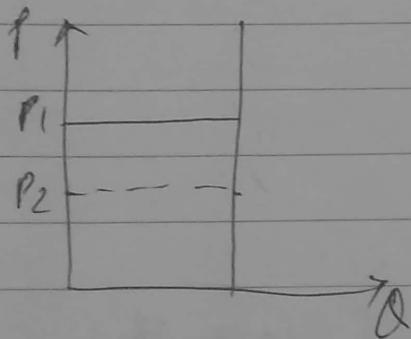
\rightarrow perfectly elastic

⇒ Perfectly elastic demand



e.g.
 stationary (pencils, pens)
 inferior goods (cigarettes)
 → Price ↓ Quality ↓ demand ↓
 Price ↑ Quality ↑ demand ↑

⇒ Perfectly inelastic demand

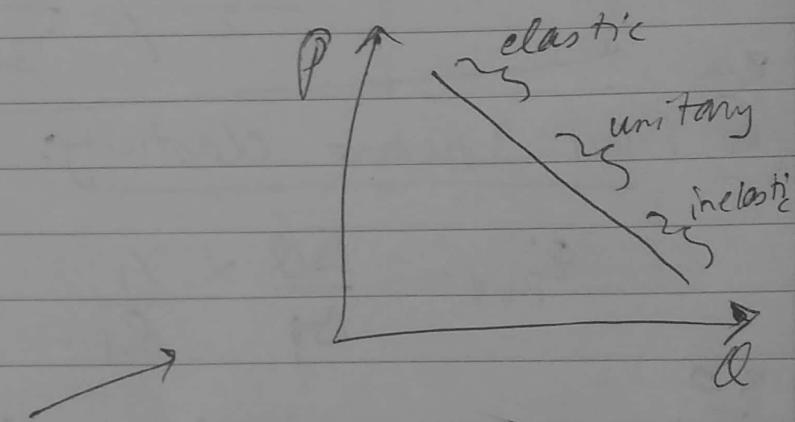


⇒ Relation of total revenue and elasticity

⇒ When the demand is elastic a decline in price increase the total revenue.

Price ↑ TR ↓ vice versa.

⇒ When the demand is Unitary ($\frac{\text{elastic}}{\text{coefficient}} = 1$) revenue does not change in either case.



Total revenue = Price × Quantity.



→ When the demand is inelastic as the price declines total revenue also declines.

→ TYPES OF elasticity-

① Arc elasticity :-
$$\frac{Q_2 - Q_1}{\frac{Q_2 + Q_1}{2}} \times \frac{\frac{P_2 - P_1}{P_2 + P_1}}{\frac{P_2 + P_1}{2}}$$

② Point elasticity :- $E_{Pt} = \frac{\Delta Q}{\Delta P} \times \frac{P_1}{Q_1}$

③ Income elasticity :- (Arc Income)

$E_{IY} = \frac{Q_2 - Q_1}{\frac{Q_2 + Q_1}{2}} \times \frac{\frac{Y_2 - Y_1}{Y_2 + Y_1}}{\frac{Y_2 + Y_1}{2}}$

γ = income.

3a
④ Point Income elasticity:

$$E_{IY} = \frac{\Delta Q}{\Delta Y} \times \frac{Y_1}{Q_1}$$

3b
⑤ Cross Price elasticity :- (Arc cross elasticity)

$$E_{cross} = \frac{Q_{2B} - Q_{1B}}{\frac{Q_{2B} + Q_{1B}}{2}}$$

A price of A causes
Δ Quantity of B

$$\frac{P_{2A} - P_{1A}}{\frac{P_{2A} + P_{1A}}{2}}$$



⑥ advertising
Educational elasticity:

$$E_{adv} = \frac{\% \text{ change in quantity}}{\% \Delta \text{ Adm expenses}}$$



Utility Analysis

1) Cardinal Approach (Budget line)/Budget constraint
 ↓
 Objective (numbers)

② Ordinal Approach (Indifference curve)
 ↓

Subjective and assumptions of fixed total utility.

→ Budget line: It is a linear curve indicating a fixed income with various combinations of two goods

$$M = P_a A + P_b B$$

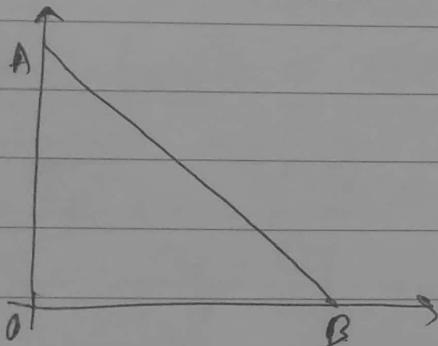
M = Income

P_a = Price of A

P_b = Price of B

A = Unit of A

B = Unit of B



$$M = \$12$$

$$P_a = \$1.5$$

$$P_b = \$1$$

Combinations?

$$(A) \frac{M}{P_a} = \frac{\$12}{\$1.5} = 8$$

$$(B) \frac{M}{P_b} = \frac{\$12}{1} = 12$$

$$(A, B) = (8, 0)$$

$$(A, B) = (0, 12)$$



A	B	$M = P_a A + P_b B$	slope = $\frac{P_b}{P_a}$
8	0	$M = (1.5)8 + (1)(0)$	
6	3	$M = (1.5)(6) + (1)(3)$	$\frac{1}{1.5}$
4	6	$M = (1.5)(4) + (1)(6)$	$\boxed{\$6 + \$6}$
2	9	$= (1.5)2 + (1)(9)$	$\frac{P_b}{P_a} = \frac{2}{3}$
0	12	$= (1.5)0 + (1)(12)$	$3P_b = 2P_a$

Maximum satisfaction
b/c spends equally on A/B

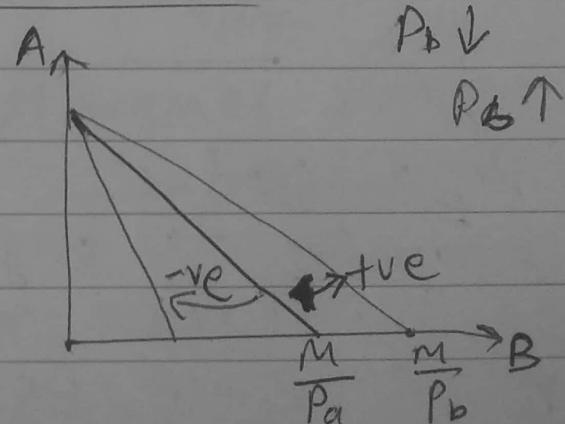
A	B	$M = P_a(A) + P_b(B)$	
16	0	$M = (1.5)(16) + 1(0)$	
14	3	$M = 1.5(14) + 3(1)$	$3P_b = 2P_a$
12	6		
10	9		
8	12		
6	15		
4	18		
2	21		
0	24		

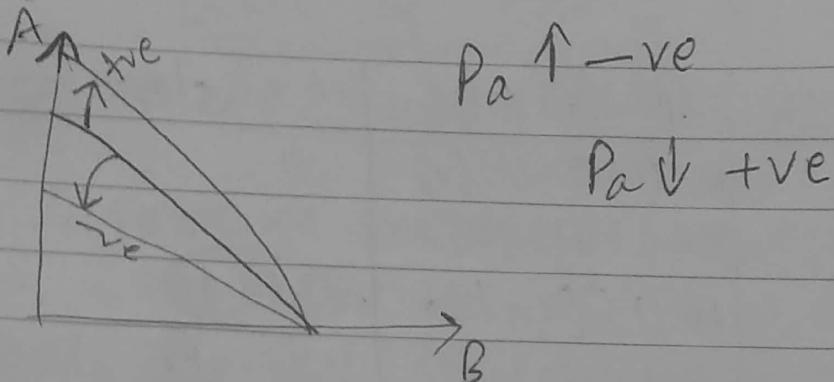
⇒ Movements in the Budget Lines

① Rotation

② Shift -

Real Income - $\frac{M}{P} = \frac{\text{Income}}{\text{price of good}}$

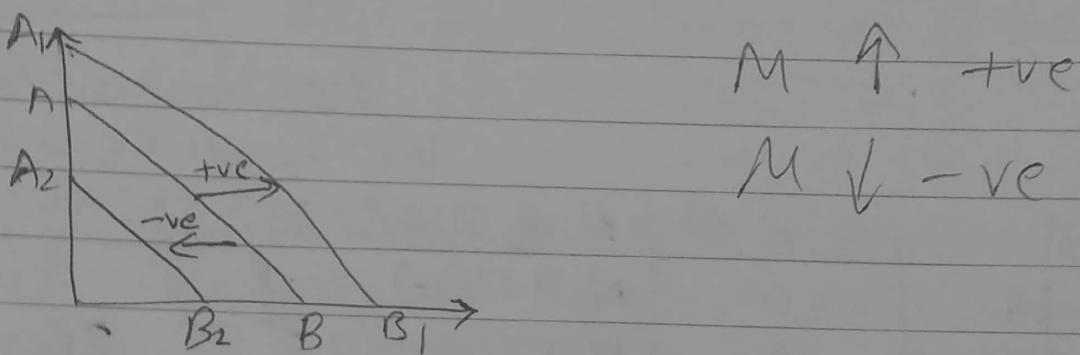




$P_A \uparrow +ve$

$P_A \downarrow -ve$

→ Income Changes:-

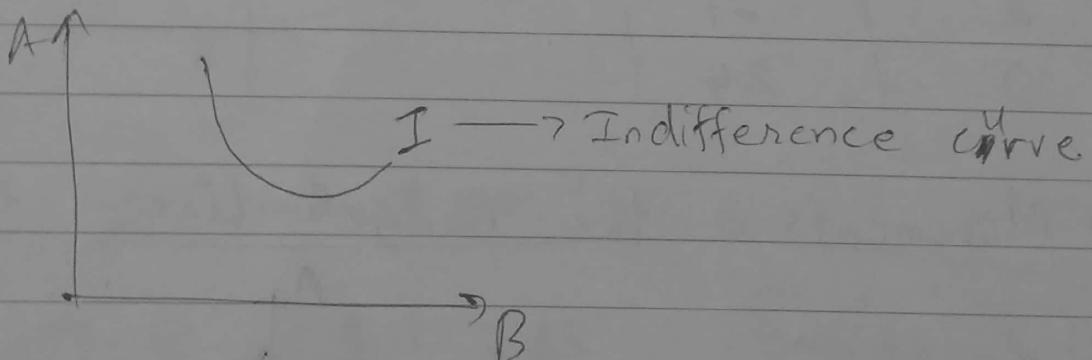


$M \uparrow +ve$

$M \downarrow -ve$

→ Ordinal Utility and indifference curves:-

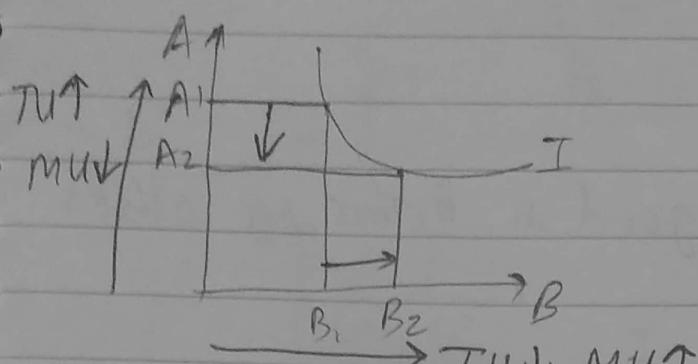
→ Indifference curve is the locus of points showing various combinations of two goods with a fixed utility level.



$I \rightarrow$ Indifference curve

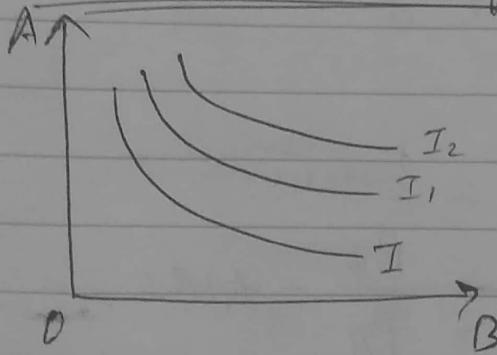
→ Properties:-

- 1) Convex to origin
- 2) Indifference map
- 3) Consumer's Equilibrium.



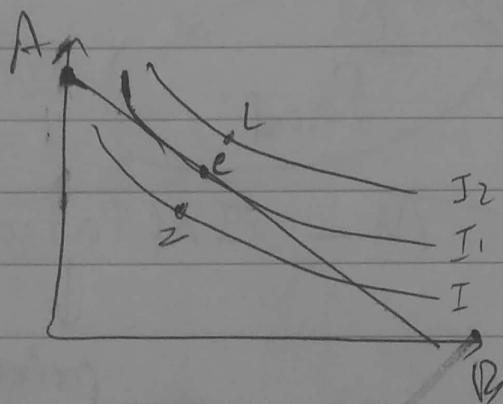
Law of diminishing marginal utility: $MU \downarrow$

→ Indifference map:



$$TU_I < TU_{I_1} < TU_{I_2}$$

→ Consumer's Equilibrium:



point e = consumers equilibrium

Slope of Budget line =

Marginal rate of Substitution

(MRS)

$$\left| \frac{P_B}{P_A} = MRS \right.$$

Budget line

$$\text{slope} = \frac{P_B}{P_A}$$

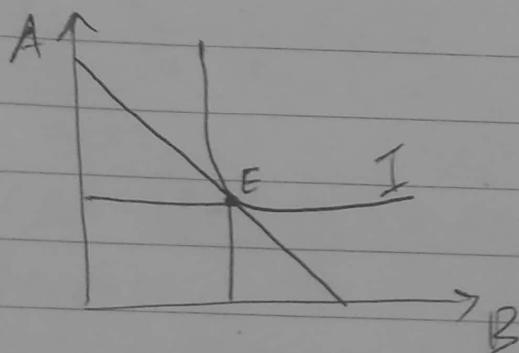
→ Relative price of one good in terms of other.

⇒ Consumer's Equilibrium:-

$$\frac{P_B}{P_A} = MRS$$

→ Deriving the demand curve keeping in view the consumer's equilibrium.

→



Equilibrium

$$\frac{P_B}{P_A} = MRS$$

⇒ Consider a normal good ($N = \text{normal good}$):

$$1) P_N \propto \frac{1}{Q_d}$$

$$2) \uparrow P_N \rightarrow \left(\frac{M}{P_{\text{good}}} \right) \downarrow$$

→ Real income

$$= \frac{M}{P_{\text{good}}}$$

= $M - \frac{\text{Inflation}}{\text{Price}} \downarrow \text{price level}$

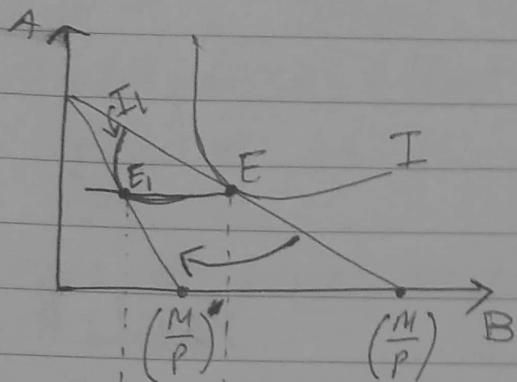
$$3) \downarrow P_N \rightarrow \left(\frac{M}{P_N} \right) \uparrow$$

Assumption

$B \rightarrow P_N \uparrow$

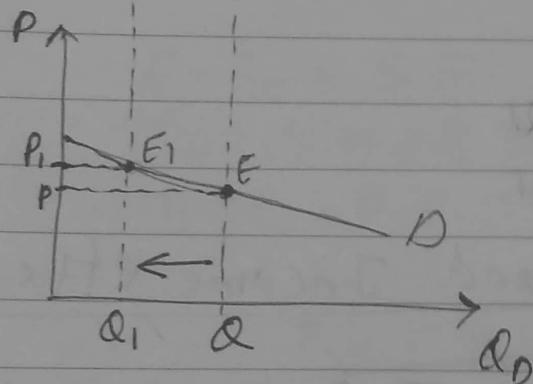
P_A is constant

Panel A

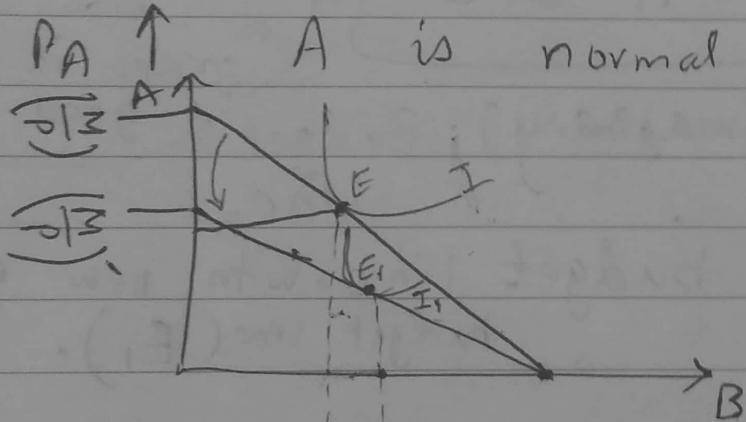


$$\left(\frac{M}{P}\right)' < \left(\frac{M}{P}\right)$$

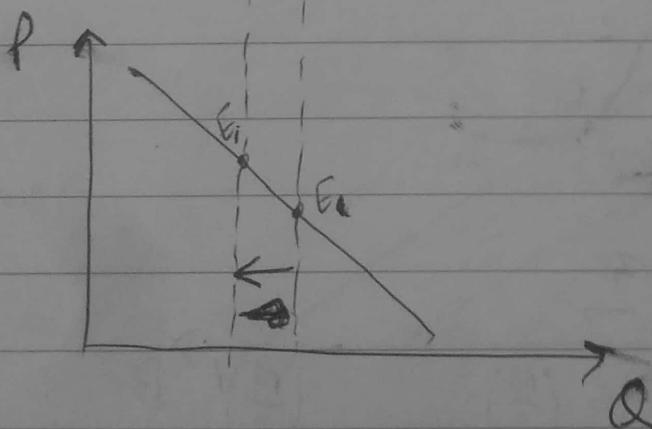
Panel B



$\Rightarrow P_A \uparrow$ A is normal good. P_B is constant

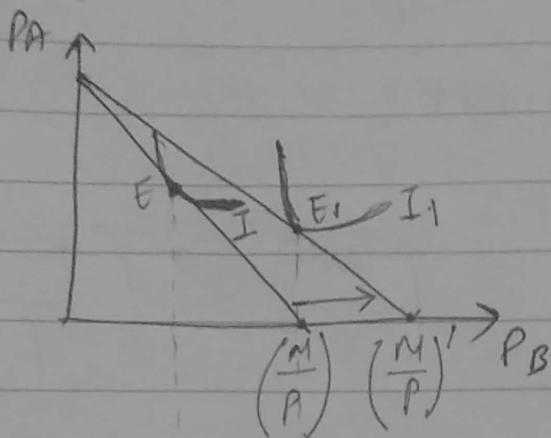


Panel A

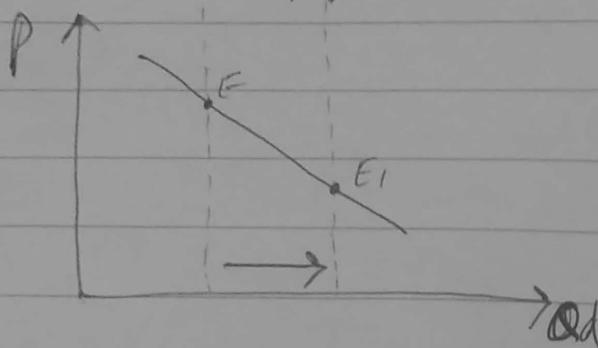


Panel B

$P_B \downarrow$ $P_A = \text{constant}$



Panel A



Panel B

for a normal good.

⇒ Substitution effect and Income effect:

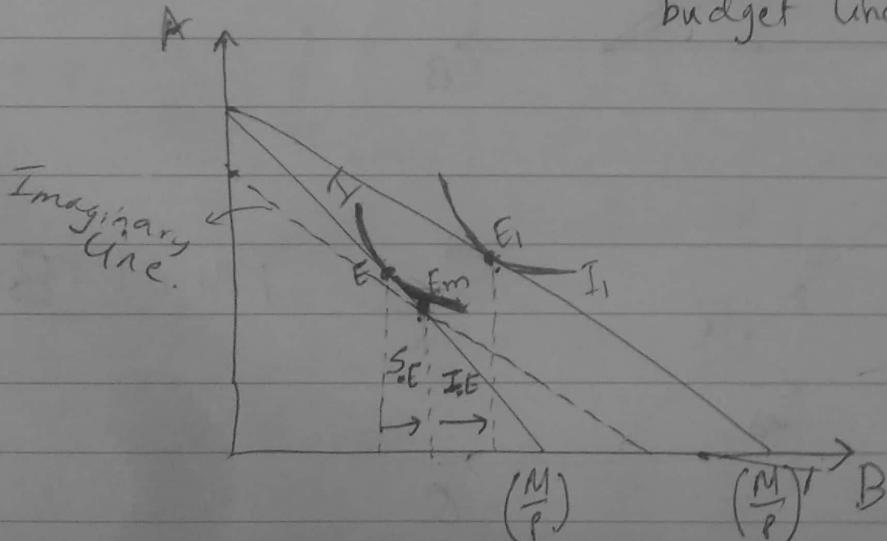
$$\text{Price effect} = S.E + I.E$$

both will be same direction in graph if normal good.

→ Draw fictitious (Imaginary) Budget Line

→ Parallel line in budget line with new equilibrium budget line (E_1).

$P_B \rightarrow \downarrow$



Demand Curve?

- Substitution effect is the change in consumption.
- Income effect change in real income.
- To study price effect draw fictitious budget line parallel to the new budget line.
- In case of price decline E_m is imaginary equilibrium.

$$E - E_m = S \cdot E$$

$$E_m - E_i = I \cdot E$$

$$E - E_i = P \cdot E$$

21/10/19



Giffen good, demand curve and price effect.

⇒ Giffen good:

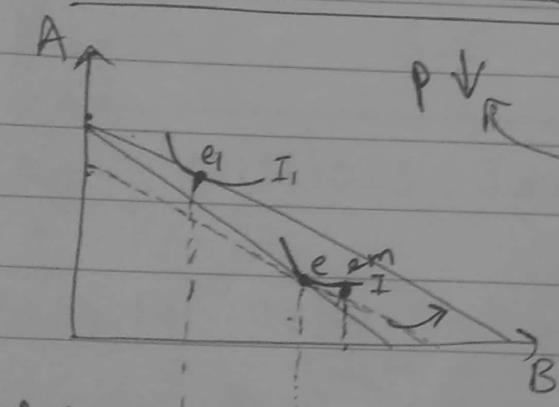
It violates the law of demand and it is an inferior good which is directly related to price.

e.g.: Rice and tea

Rice Rs 60/kg → Rs 200/kg

inferior → ISO and above
Quality (low) normal / superior.

⇒ Demand Curve (Giffen good)

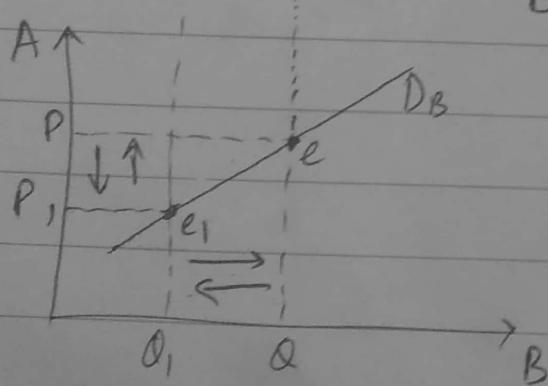


① Good B is giffen good

② price of B declines

③ Budget line rotates outward

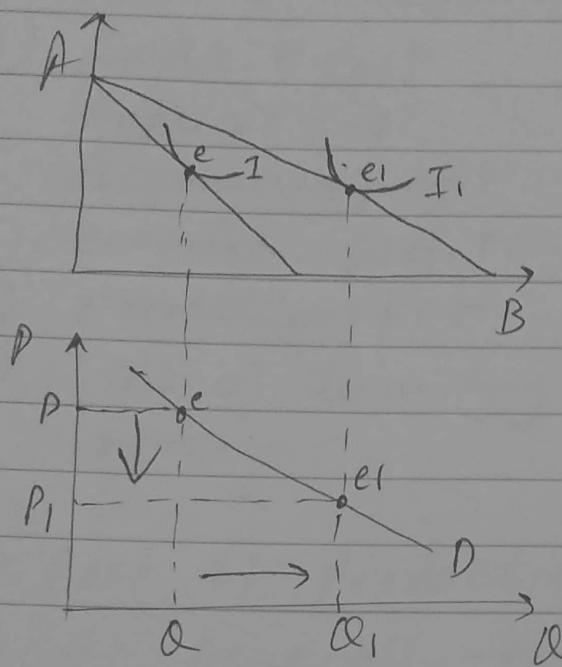
④ New equilibrium is e_1 at I_1 .



$e_m - e_g = \text{Income effect}$
-ve

$e_1 - e = \text{Substitution effect.}$

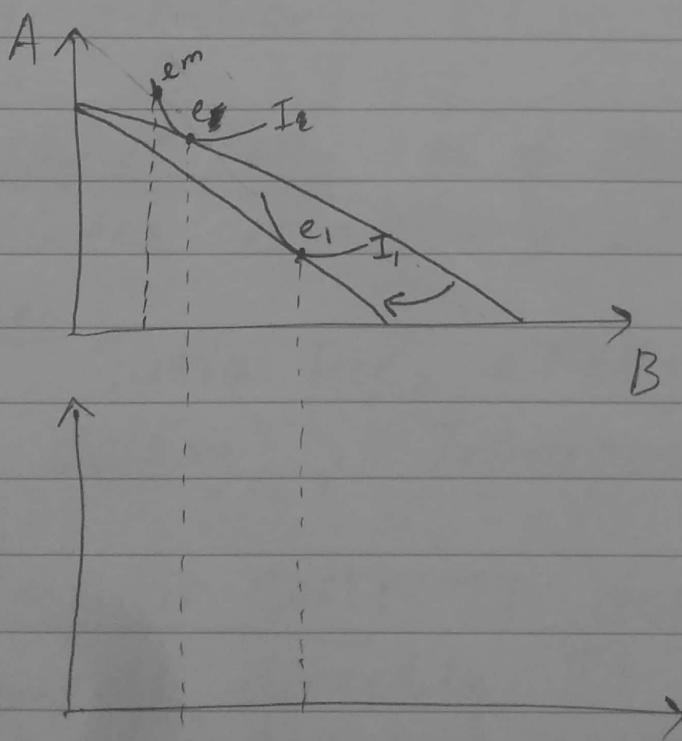
Demand curve (Normal good) :-



⇒ Price effect:

- ① Income effect offsets the substitution effects.

Price ↑se At $e_1 \rightarrow P_1 > P$



23/10/19



Topics:

- 1) Cost of Production.
- 2) Explicit cost
- 3) implicit cost
- 4) Accounting profit
- 5) economic profit
- 6) normal profit
- 7) Law of diminishing returns.

⇒ Cost of Production:

→ cost generally refers to price. Cost is defined as the value of a resource given up to produce a good or a service.

⇒ Resource: Anything used in production and distribution.

⇒ Explicit Cost: is a direct expense. cost which includes monetary payments.

Example: Tuition Fee, utility bills, For employer(wage, salary), Transport fee.

⇒ Implicit cost: It does not involve monetary payments directly. It is more of an opportunity cost. (indirect expense).



Examples: (implicit)

For employer

- Employee Training (implicit) program can help the organisation with better trained employees they perform better so the cost in training is implicit cost. (organization pays for the employee).
- Faculty development programs

Jobs	own
Salary	Business :-
59,000	70,000 → after 1 year
58,000	100,000

④ Accounting Profit:-

$$\boxed{\text{Accounting Profit} = \text{Total Revenue} - \text{Explicit cost}}$$

Profit

→ accounting profit is always \geq economic profit.

⑤ Economic profit:-(EP)

$$\boxed{EP = \text{Total Revenue} - (\text{Explicit + Implicit}) \text{ cost}}$$

$$A.P \geq E.P$$

→ Total Revenue is Price \times Quantity.



Costs of a business

Total Revenue	\$ 120 000	} explicit cost
T-shirts	40,000	
salaries	18000	
utilities	5000	
Forgone interest	1 000	} Implicit cost -
Forgone wage	\$22000.	
Forgone rent	5000	
Forgone income	5000	

$$\Rightarrow A.P = \text{Total Revenue} - \text{Explicit cost}.$$

$$= 120000 - (40000 + 18000 + 5000)$$

$$A.P = 57000$$

$$\Rightarrow E.P = TR - (\text{Explicit} + \text{Implicit}) = 120000 - 96000$$

$$E.P = 24000$$

\rightarrow Normal Profit (Break even):-

\rightarrow Cost of staying in the business

\rightarrow Opportunity Cost of the entrepreneur

$$TR = TC$$

↓
total cost.



Law of Diminishing Returns: Technology & land areas are fixed

- Short run (production) → Labour variable
- Long run (production) → All resources are variable
expansion takes place
- Fixed resource
- Variable resource.

e.g.: Labour is variable resource in both short ~~fixed~~
and long run.

⇒ Statement:- In order to increase total product units of variable resource are added to the fixed resource successively. The total product increases to a certain point but the marginal product declines.

Units of variable resource	Total product	Marginal product	Average product
0	0	0	0
1	10	10	10
2	25	15	25/2
3	45	20	15
4	60	15	15
5	70	10	14
6	75	5	25/2
7	75	0	75/7
8	70	-5	35/4

graphs on
next page.



(TP)

⇒ Total product = Total output / Total quantity

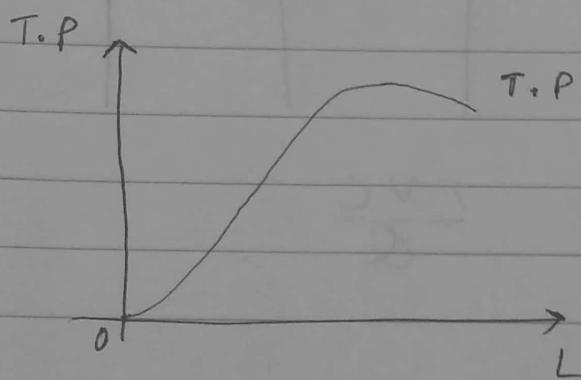
(MP)

⇒ Marginal product = $\frac{\text{Change in Total Product}}{\text{Change in labour}}$

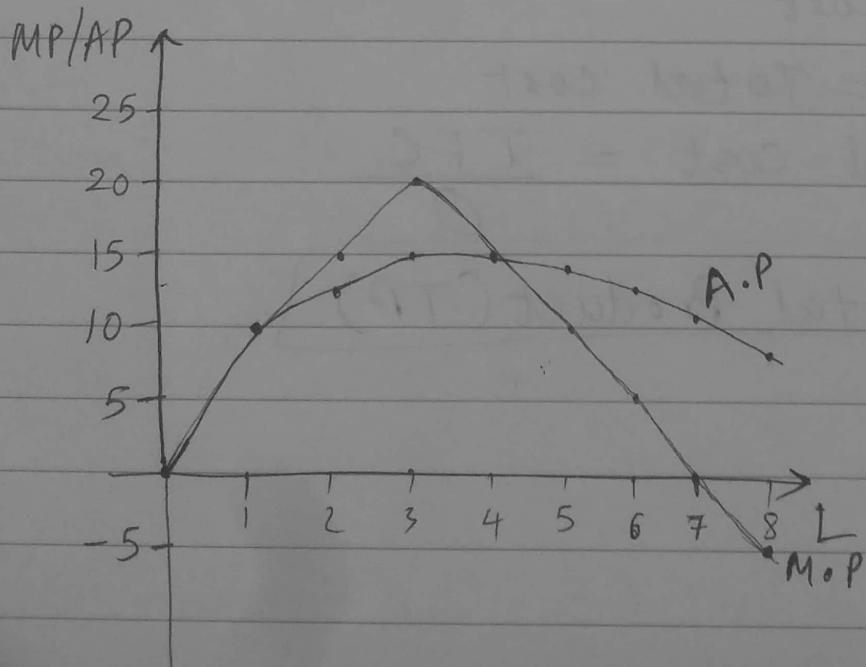
$$= \frac{\Delta TP}{\Delta L}$$

⇒ (AP) Average Product = $\frac{\text{Total product}}{\text{Specific unit of labour}}$

⇒ PANEL A :-



⇒ PANEL B :-





TP	TFC	TVC	TC	AFC	AVC	ATC	MC
0	100	0	100				
1	100	90					
2	100	170					
3	100	240					
4	100	300					
5	100	370					
6	100	450					
7	100	540					
8	100	650					
9	100	780					
10	100	930					

AVC = Average Variable cost = $\frac{TVC}{Q}$

ATC = Average Total cost = $\frac{TC}{Q}$.

TFC = Total fixed cost

TVC = Total variable cost

TC = TFC + TVC = Total cost

AFC = Average Fixed cost = $\frac{TFC}{Q}$

Quantity (Q) = Total Product (TP)

6/9/10/US/16
min LR, -LR, -GR,

18. In 2002 the U.S. Postal Service increased first-class postage rates from 34¢ to 37¢. The service had been losing money. One of the reasons is increased competition from companies such as United Parcel Service and Federal Express. Another reason is the use of faxes and e-mail, as well as electronic bill payment. With this decrease in demand for postal services, why do you think that the Postal Service is seeking a rate increase?
19. A Canadian apparel company, Roots, agreed to provide the U.S. Olympic team at the 2002 Winter Olympics with various types of clothing, including berets, for free, and further, to turn over a portion of its profits on sales of this clothing to the U.S. Olympic Committee. The beret became an instant success, and Roots sold a large number of them. What type of elasticity does this arrangement represent?

PROBLEMS

1. The Aryan Paper Company lowers its price of envelopes (1,000 count) from Rs. 6 to Rs. 5.40. If its sales increases by 20 percent following the price decrease, what is the elasticity coefficient?
2. The demand function for a cola-type soft drink in general is $Q = 20 - 2P$, where Q stands for quantity and P stands for price.
 - a. Calculate point elasticities at prices of 5 and 9. Is the demand curve elastic or inelastic at these points?
 - b. Calculate arc elasticity at the interval between $P = 5$ and $P = 6$.
 - c. At which price would a change in price and quantity result in approximately no change in total revenue? Why?
3. The equation for a demand curve has been estimated to be $Q = 100 - 10P + 0.5Y$, where Q is quantity, P is price, and Y is income. Assume $P = 7$ and $Y = 50$.
 - a. Interpret the equation.
 - b. At a price of 7, what is price elasticity?
 - c. At an income level of 50, what is income elasticity?
 - d. Now assume income is 70. What is the price elasticity at $P = 8$?
4. Mr. Ali has the following demand equation for a certain product: $Q = 30 - 2P$.
 - a. At a price of Rs. 7, what is the point elasticity?
 - b. Between prices of Rs. 5 and Rs. 6, what is the arc elasticity?
 - c. If the market is made up of 100 individuals with demand curves identical to Mr. Ali's, what will be the point and arc elasticity for the conditions specified in parts a and b?
5. The Teenager Company makes and sells skateboards at an average price of Rs. 70 each. During the past year, they sold 4,000 of these skateboards. The company believes that the price elasticity for this product is about -2.5. If it decreases the price to Rs. 63, what should be the quantity sold? Will the revenue increase? Why?
6. The ABC Company manufactures AM/FM clock radios and sells on average 3,000 units monthly at Rs. 25 each to retail stores. Its closest competitor produces a similar type of radio that sells for Rs. 28.
 - a. If the demand for ABC's product has an elasticity coefficient of -3, how many will it sell per month if the price is lowered to Rs. 22?
 - b. The competitor decreases the price to Rs. 24. If cross-elasticity between the two radios is 0.3, what will ABC's monthly sales be?
7. The Mohan Bagan football team plays in a stadium with a seating capacity of 1,80,000. However, during the past season, attendance averaged only 1,50,000. The average ticket price was Rs. 30. If price elasticity is -4, what price would the team have to charge in order to fill the stadium? If the price were to be decreased to Rs. 27 and the average attendance increased to 1,60,000, what is the price elasticity?
8. The Mesa Redbirds football team plays in a stadium with a seating capacity of 80,000. However, during the past season, attendance averaged only 50,000. The average ticket price was Rs. 30. If price elasticity is -4, what price would the team have to charge in order to fill the stadium? If the price were to be decreased to Rs. 27 and the average attendance increased to 60,000, what is the price elasticity?
9. The Efficient Software Store had been selling a spreadsheet program at a rate of 100 per month and a graphics program at the rate of 50 per month. In September 2007, Efficient's supplier lowered the price

for the spreadsheet program, and Efficient passed on the savings to customers by lowering its retail price from Rs. 400 to Rs. 350. The store manager then noticed that not only had sales of the spreadsheet program risen to 120, but also the sales of the graphics program increased to 56 per month. Explain what has happened. Use both arc price elasticity and arc cross-elasticity measures in your answer.

10. Given the demand equation $Q = 1,500 - 200P$, calculate all the numbers necessary to fill in the following table:

P	Q	Elasticity		Total Revenue	Marginal Revenue
		Point	Arc		
\$7.00					
6.50					
6.00					
5.50					
5.00					
4.50					
4.00					
3.50					
3.00					
2.50					

$$\frac{\Sigma \Delta}{\Delta P} = \frac{d^+}{dS} + \frac{d^+}{dP}$$

11. Would you expect cross-elasticity between the following pairs of products to be positive, negative, or zero?
- Television sets and VCRs
 - Rye bread and whole wheat bread
 - Construction of residential housing and furniture
 - Breakfast cereal and men's shirts
- Explain the relationship between each pair of products.
12. In order to attract more customers on Mondays (a slow day), Alex's Pizza Shop in Austin decided to reduce the price of their pizza rolls from Rs. 3.50 to Rs. 2.50. As a result, Monday sales increased from 70 to 130. Also, Alex's sales of ready-to-eat snacks rose from 40 to 90.
- Calculate the arc price elasticity of demand for the pizza rolls.
 - Calculate the arc cross-price elasticity of demand between ready-to-eat snacks sales and pizza rolls prices.
13. According to a study, the price elasticity of shoes in the United States is 0.7, and the income elasticity is 0.9.
- Would you suggest that the Brown Shoe Company cut its prices to increase its revenue?
 - What would be expected to happen to the total quantity of shoes sold in the United States if incomes rise by 10 percent?
14. A book store opens across the street from the University Book Store (UBS). The new store carries the same textbooks but offers a price 20 percent lower than UBS. If the cross-elasticity is estimated to be 1.5, and UBS does not respond to its competition, how much of its sales is it going to lose?
15. A local supermarket lowers the price of its vanilla ice cream from Rs. 3.50 per half gallon to Rs. 3. Vanilla ice cream (unit) sales increase by 20 percent. The store manager notices that the (unit) sales of chocolate syrup increase by 10 percent.
- What is the price elasticity coefficient of vanilla ice cream?
 - Why have the sales of chocolate syrup increased, and how would you measure the effect?
 - Overall, do you think that the new pricing policy was beneficial for the supermarket?
16. The Compute Company store has been selling its special word processing software, Aceword, during the last 10 months. Monthly sales and the price for Aceword are shown in the following table. Also shown are the prices for a competitive software, Goodwrite, and estimates of monthly family income. Calculate the appropriate elasticities, keeping in mind that you can calculate an elasticity measure only when all other factors do not change.

Month	Price Acewood	Quantity Acewood	Family Income	Price Goodwrite
1	\$120	200	\$4,000	\$130
2	120	210	4,000	145
3	120	220	4,200	145
4	110	240	4,200	145
5	114	230	4,200	145
6	115	215	4,200	125
7	115	220	4,400	125
8	105	230	4,400	125
9	105	235	4,600	125
10	105	220	4,600	115

17. The demand curve for product X is given as $Q = 2000 - 20P$.
- How many units will be sold at Rs. 10?
 - At what price would 2,000 units be sold? 0 units? 1,500?
 - Write equations for total revenue and marginal revenue (in terms of Q).
 - What will be the total revenue at a price of Rs. 70? What will be the marginal revenue?
 - What is the point elasticity at a price of Rs. 70?
 - If price were to decrease to Rs. 60, what would total revenue, marginal revenue, and point elasticity be now?
 - At what price would elasticity be unitary?
18. The Transportation Authority in Anytown, USA, raised bus fares from Rs. 1 to Rs. 1.15 on January 1, 2006. The authority's statistics show that the number of passengers riding buses decreased from 672,000 in 2006 to 623,000 in 2007.
- How much did revenue change?
 - What is the arc elasticity for bus travel in Anytown?
 - The answer to b would be correct if all conditions (except price) remained the same between 2006 and 2007. Can you think of any other changes that would have affected the result?
19. (Read the "Newspapers and Their Price Elasticity" section in Appendix 4A before answering the question.)
- What is the arc demand elasticity for the London *Times*? What happened to revenue as a result of the price decrease?
20. The Distinctive Fashions Company increased its advertising budget for its leading brand of ladies' dresses from Rs. 10,000 in 2006 to Rs. 15,000 in 2007. Its sales increased from 900 units to 1,050 units, while the price remained the same at Rs. 120 per dress. Calculate the advertising elasticity of these dresses. Was this a wise move by the company?
21. Manning Inc. is the leading manufacturer of garage doors. Demand for residential garage door sales depends, of course, on the rate of new house building activity, which in turn depends on changes in income per capita. During the past year, Manning sold 10,000 garage doors at an average price of Rs. 1,500 per door. In the coming year, disposable income per capita is expected to increase from Rs. 32,000 to Rs. 34,000. Without any price change, Manning expects current-year sales to rise to 12,000 units.
- Calculate the arc income elasticity of demand.
 - The company economist estimates that if the price of doors is increased by Rs. 100, they could sell 11,500 doors. What is the arc price elasticity and what would be the company's revenue?
 - Should they raise the price even more?