Micro Economics

KG

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Utility - want satisfying power that can generate welfare to us.
wants are unlimited, resources limited, hence we need an economic behaviour so that we maximise our satisfaction level with that available.

We prepare our preference list, topmost item that which maximises our satisfaction level.
Generalising / similarities inspite of differences
2 schools of economics
- Cardinal measure of utility - we can quantify utility (quantitative)
- ordinal " " " - relative measurement of utilities which means there needs to be atleast two (qualitative) - greater than or less than

eg- Biryani is more satisfying than pens.

Cardinal - we measure utility based on what money we are ready to pay for it at a particular point of time. not necessary what is its market value but how much we are ready to pay.
eg- Ram ready to pay 5 ₹ for pen.
someone else " " 10 ₹
depending on how desparate we are to get it.

After eating Biryani, we cannot ignore ~~den~~ need for 2nd plate (only for a fraction of sec), we may be ready to pay lesser, then 3rd plate 0

Conclusions:
1) Individual utility decreases in succession. (because its no. is plenty, value is decreasing)

1st -	60/- individual utility is
2nd -	40/- equivalent
3rd -	10/- to
Total utility =	100/-

marginal utility = $\frac{\Delta TU}{\Delta \text{no. of units}}$

from 0 to 1 = $\frac{60-0}{1}$

from 1 to 2 = $\frac{100-60}{1}$ TU at 2nd is 100

Change in Total utility because of consumption / possession of any commodity. not necessarily always

- Generality - MU decreases because in succession, the no. of that commodity increases so its value decreases. demand

Assumption for above descriptions - consumer must be a rational human being.

- you are following your own preference list
  - in 15₹, fruit first with 1000₹, anything first but not
  - ~~We use~~ ₹.
  - We cannot quantify satisfaction level for ~~eg~~ everything in terms of profit / loss.

- utility is additive as long as utility
- follows law of diminishing marginal utility
  - when a consumer ~~to~~ consumes / possesses more of a certain comm., want satisfying power decreases. for each & every successive commodity
- utility is cardinally measured.

eg - After 2nd plate, we will think because 3rd plate 10/- and notebook 30/-
Then we are ready to pay for 2nd notebook ~~for~~ 10/-, then comparison with 3rd plate, we become indifferent - can't decide

- income is unlimited
- consumer is yet to reach satiety
- marginal utility of money remains constant

Price you are ready to pay

$$MU_x = P_x \cdot MU_m$$

Constant value

$$MU_y = P_y \cdot MU_m$$

Law of equimarginal utility

$$\Rightarrow \frac{MU_x}{P_x} = \frac{MU_y}{P_y} = MU_m$$

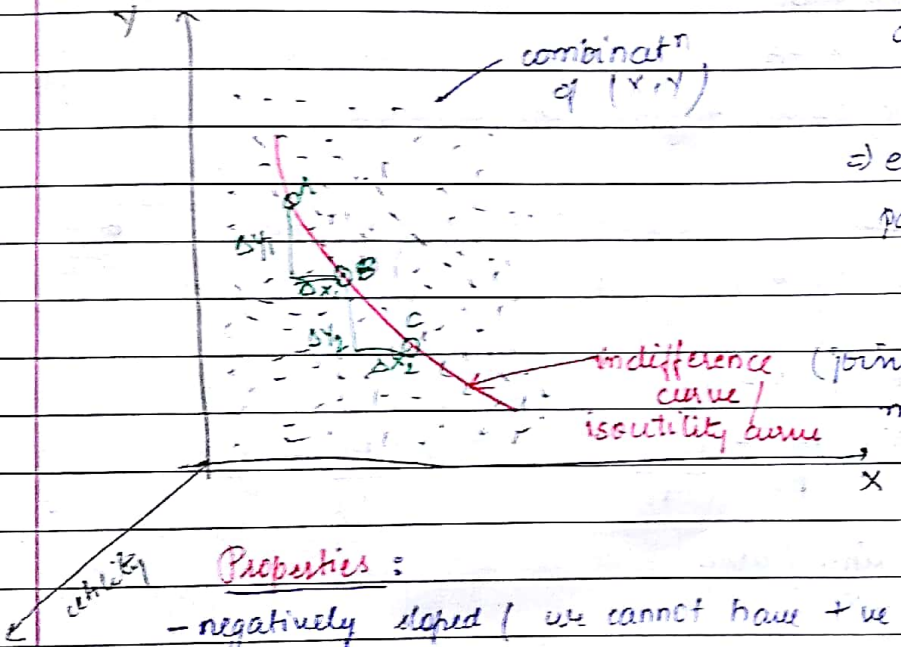
$$\frac{MU_x}{MU_y} = \frac{P_x}{P_y}$$

- as long as MU of 1 is greater than MU of other, we are ready to pay for it.

when same, we become indifferent

100 ₹ has diff meaning for a beggar and billionaire.
Then how do we say money has constant MU.
For this, ordinal utility definit^n given ⇒ money ~~com~~ measured relatively

- Utility measured ordinally
- limited money income
- rationality - every consumer has his separate list of goods, & knows which gives him maxm utility
- transitivity, A preferred over B, B over C ⇒ A over C
- diminishing rate of substitution.



Suppose we consume 2 commodities X & Y.

⇒ each & every point represents a particular utility

(joining points where I feel my level of satisfaction is same)

Properties :
- negatively sloped / we cannot have +ve, law of diminishing rate of substitution
- convex to the origin

$$\text{rate of substitution} = \frac{\partial f_1}{\partial x_1} \quad \frac{\Delta Y_1}{\Delta X_1} > \frac{\Delta Y_2}{\Delta X_2} > \frac{\Delta Y_3}{\Delta X_3}$$

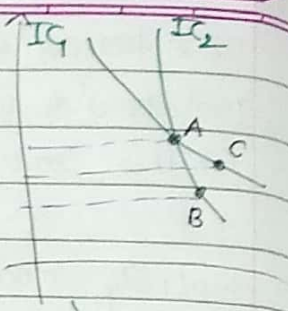
as ~~we~~ X is increasing, ⇒ ~~the~~ want satisfying ~~curve~~ power w.r.t X is decreasing

⇒ we are becoming more & more indifferent w.r.t X

⇒ ~~the MUP of Y is~~ Y is becoming more valuable

⇒ There will be a point beyond which we will not be ready to substitute Y.

- two indifference curves never intersect

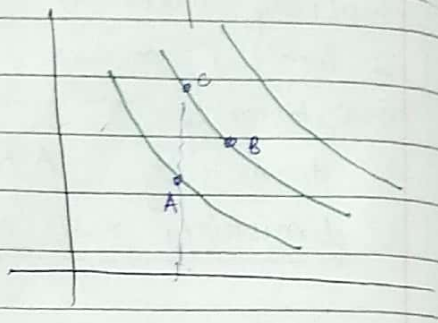


A, C on IC_1 ⇒ Utility same

A, B on IC_2 ⇒ " " = B & A

By law of transitivity, $U_A = U_B$

Hence, should be parallel.



To compare U_A with U_B.

$U_B = U_C$

C is higher (same X)

⇒ $U_C > U_A$

⇒ $U_B > U_A$

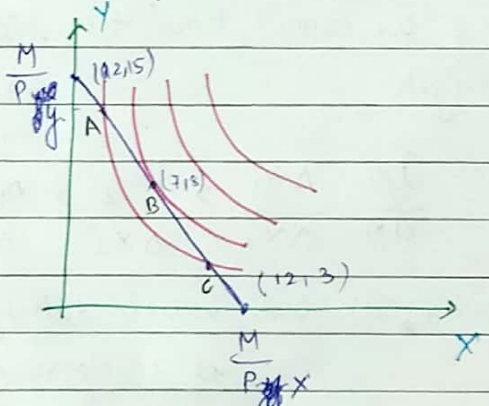
⇒ higher the curve, higher the wellness.

Suppose income (for purchasing X & Y / total) increases, their value will also increases)

$$M = P_x X + P_y Y$$

$$X = \frac{M}{P_x} - \frac{P_y Y}{P_x} \qquad Y = \frac{M}{P_y} - \frac{P_x X}{P_y}$$

Budget line / curve



Slope

Point of Tangency

A, B, C lie on budget line but we choose B because we want to maximise utility.

B is called consumer's equilibrium point defined when consumer maximises his utility under a given budget constraints.

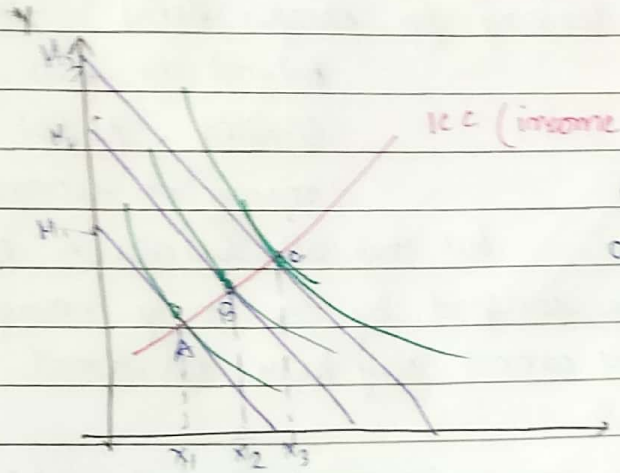
Assumptions / conditions

1) Marginal rate of substⁿ must be equal to price ratio

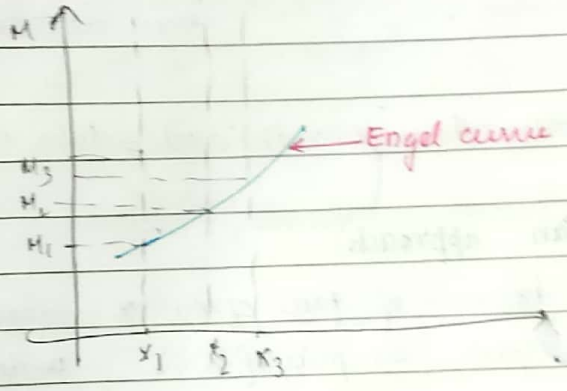
Micro

$MRS = \frac{P_x}{P_y}$ (Price ratio)

ii) 1st condition must be fulfilled at highest possible indifference curve ⇒ budget line must be tangent to " curve



ICC (income consumption curve)
locus of points of consumer's eqm that is generated due to change in budget line (income) - shows

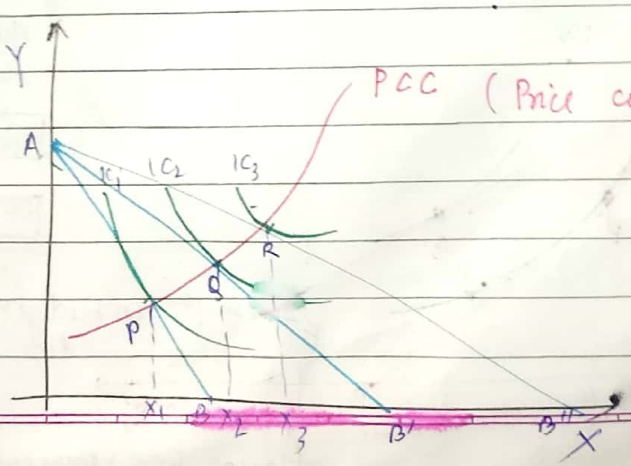


← Engel curve (considers eqm quantity of one commodity can't be generated without ICC)

Income effect of price change:

~~low~~ price of a commodity decreases, for a fract" of sec cur ⇒ real income has increased.

Case: 20 Rs, price of tomato = 10Rs/kg ⇒ purchased 1kg tomato rest for comm. Y



PCC (Price consumption curve)

more slopy (ready to buy more Y)

Price change is a consequence of
- income effect
- substitute "

↓ quality of 2 items nearly same, we have a tendency of looking for cheaper items. Why?
behind the scene, our resources are limited, do not want to waste money on unnecessary items
but this all depends on satisfaction level.
Some can be satisfied by one thing, may not be unnecessary for him, hence cannot say him irrational.

30.01

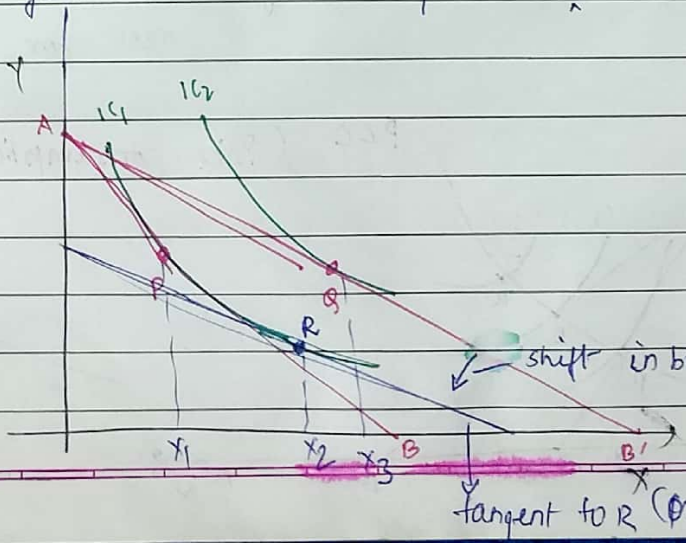
- normal goods - income increases then demand ↑
- inferior " - " " then demand ↓

- By default, unless otherwise mentioned - take as normal.

PCC (Hicksian approach)

→ because of decrease of price of x, X increases by X_3X_1
For Giffen goods, as price of X ↓, demand also decreases

Let, because of some reasons, income ↓
then budget line will shift downward (parallely if all other factors remain same)
Hicks assumed that the budget line will shift in such a way that you will return to previous (original) IC.



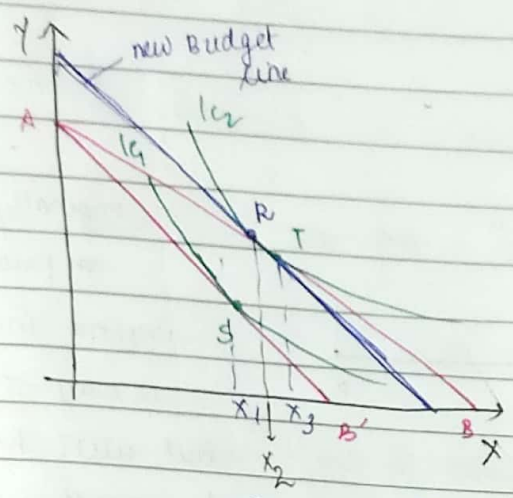
due to PE = X_1X_3
~~due to IE = X_2X_3~~

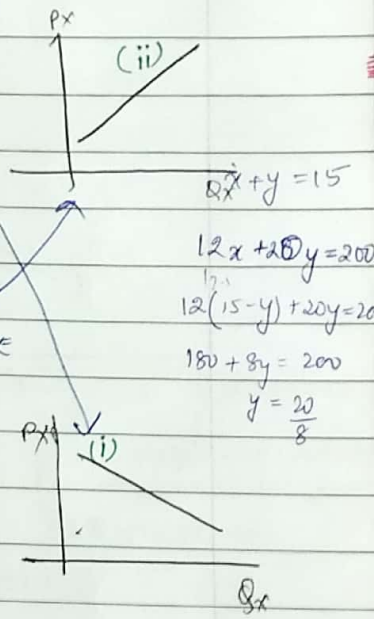
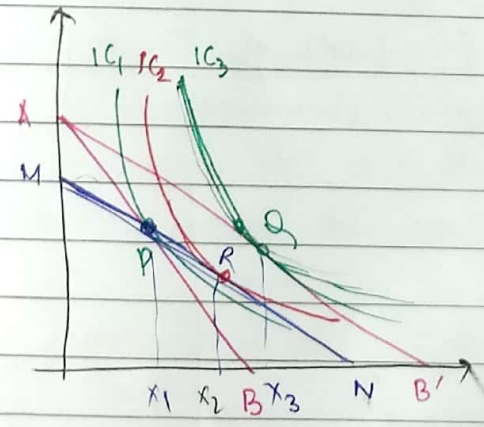
SE = PE - IE
= $X_1X_3 - X_2X_3$
SE = X_1X_2

B*B' - price of X ↓

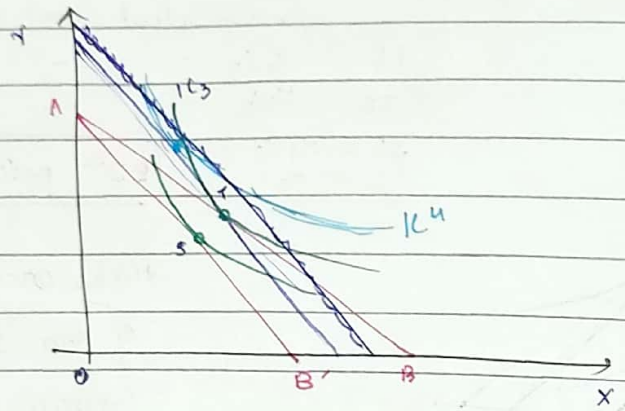
P → Q PCC

Q → R ICC (steeper because no. of Y will also decrease with ~~pr~~ income decrease).



~~~ Silent about Y

PE = X_1X_3

IE = X_1X_2

SE = $X_1X_3 - X_1X_2$ = X_2X_3

BB' - price of x ↑

thicks assumed because of some factors, your Income increase. in such a way that, you will shift towards orginial IC

	(X) poor qw	(Y) good qua	requirement
Total 100	4kg × 10₹	3kg × 20 ₹	7kg 100₹
Income ↑ 120	2kg × 10₹	5kg × 20 ₹	7kg ~~120~~ ₹

income ↑, demand ↓ - inferior

	poor qua	good qua	requ..
Total 200	10kg × 10₹	5kg × 20₹	15kg @ 200 ₹
price of poor ↑	12.5kg × 12 ₹	2.5kg × 20 ₹	



Slutsky's approach :



PE = X_1X_3 IE = X_2X_3

SE = X_1X_2

Slutsky assumed because of some ext factors, your income reduce.

It will reduce in such a way that if you wish you can purchase original combination of X & Y.

∴ It will pass through P
~~~

But P is not an eqm point now, however it will cut another IC (IC_2) and here the utility also increases.



income ↑

originally IC_3,

price x ↑, then to S

income increase in such a way ; no more eqm but will be tangent to another IC_4

05.02

Demand - desire for something supported by purchasing power and willingness to pay for it. (individual demand)

potential buyer - has money in pocket but not willing to pay.

When all ind. demands are added up, it becomes market-demand

- Dynamic economy - for a long period ?
- Static economy -

P_x - market price

For short time period

→ price determines whether one is actually buying or willing to pay.

→ if P_x less, demand more and vice-versa.

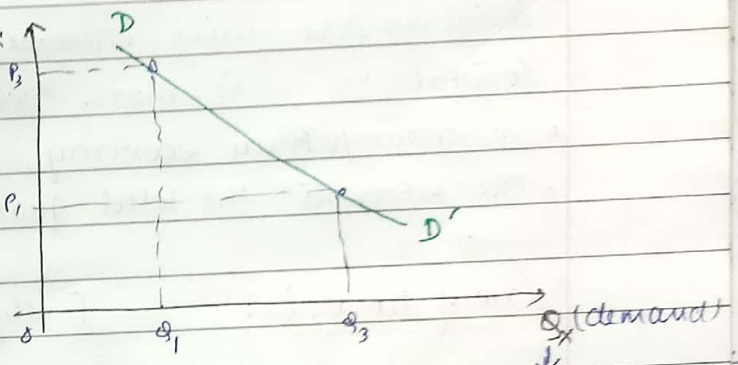
Assuming linear relationship

$Q_x = f(P_x)$

$Q_x = a - bP_x$ / $Q_x = aP_x^{-b}$

Determinance of demand

$Q_x = f(P_x, \dots)$



Q_x (demand) ↓ dependent variable

if ~~to be considered for~~ 2 yrs or less

When all other things are at certain (same) level,

① if price increases, demand will decrease and when price decreases, demand will increase

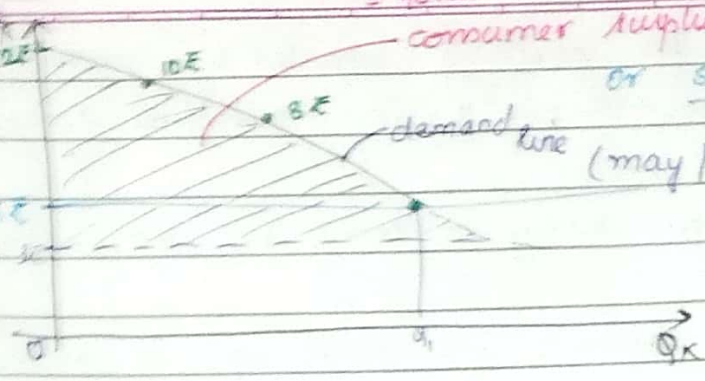
* Consumer credit facilities - if for the same product at one place, there is ~~inst~~ payments in installment facility with OEMI and direct payment as well, ~~de~~ demand in that place will increase in comparison to another place where this facility is not there.

* Other factors that will determine demand -

② income

area = total consumer surplus at price of 5₹
or social welfare

Considering utility



(may / may not be a st. line)

Situation:

Suppose I'm desperate to get a pen and ready to pay max 12₹ so that is its utility. But the price of the pen is 5₹, hence I paid 5₹.

So, in this case I'll assume that I ~~am making~~ have a surplus of 7₹.

But all are not like me. Suppose, someone else is ready to pay 10₹. Consumer surplus equivalent = 5₹

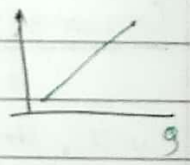
Social welfare will increase when price decreases.
Societal " is more where price is less.

- In a competitive economy, it is less (welfare)
- OQ_1 represents the total quantity demand

Law of demand : (-vely sloped)

Exceptions: Where this law doesn't work for short period

1. Expectation of rise in price in future. (to avoid a bitter situat°)
   Crop failure - prices ↑ day by day - you estimated that it will shoot in few days
   ⇒ demand will increase.



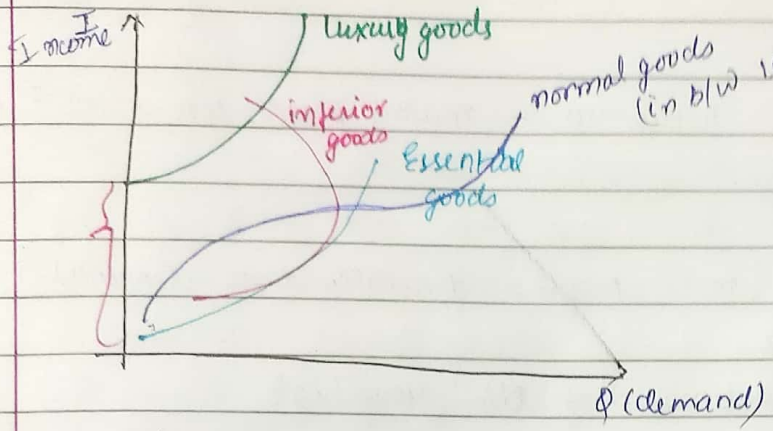
2. Less bothered about price on particular occasions ~~beca~~. price ↑ you don't can't avoid that commodity on that day.

3. Giffen goods - (any) not necessarily special commodity essential commodity consumed by poor HH comprising major portion of their income

poor	10/-	4 kg	40/-
good	20/-	3kg	60/-
			100/-

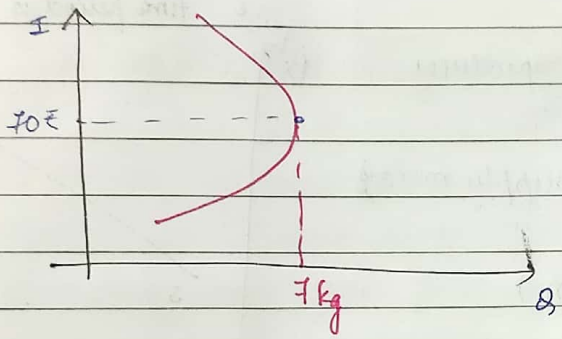
If price of poor quality increase. to 12 ₹
5 poor + 2 kg good qual.
Hence price ↑, demand ↑

06.02



Luxury goods - goods whose demand arise beyond a certain level of income only.
Essential goods - essential for survival.

normal goods - demand ↑ with income
inferior " - demand ↓ " increase in income



Extreme case - 30₹ income,
priority is to fill stomach. As it increases to 40, 50, 60, 70, you will increase consumptn hence demand ↑.
After you reached 7 kg, now income ↑ you can think of substituting inferior good with good ones.

Other factors determining demand:

Related goods:

(3) - price of substitute
Coffee = X tea = Y
Px is same, but Py ↓
more demand of X (due to existing customer buying more or new consumer → who decreased coffee, started tea also)
demand x ↓

- complementary good
X = butter C = bread
Pc ↓, demand of c ↑
⇒ demand of x ↑

(4) consumer credit facilities

(5) demonstration effect

i) Band wagon effect :- uplifting social status (may be perceived by actual)
remote areas - one person bought TV, seeing him, others also start buying it, demand ↑

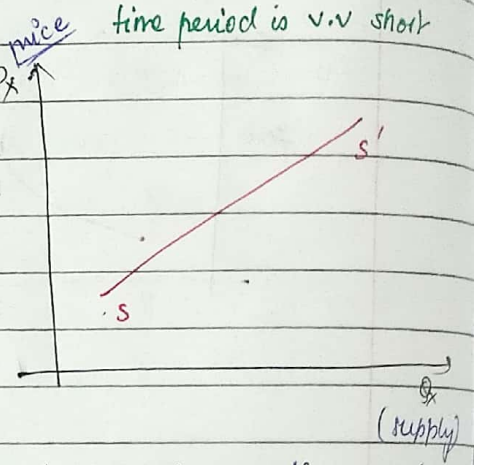
ii) Snob effect :-
Nokia 110 - many people use it so I will buy Android. (..

→ Population effect - (more people, generally more demand)
→ Distribution of income
- even - demand of NG very high
- uneven - demand for EG more

SUPPLY

Consider yourself producer.
- if demand ↑, I will supply more
price ↑, " "
(short term)

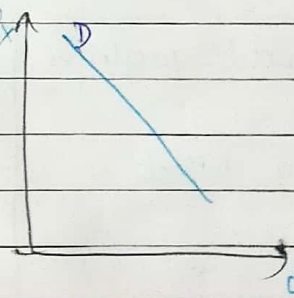
time period is v.v short



- long term
- govt policies (restricting raw material from other country)
- price same but COP very high, you will reduce your scale of production

Market price not influenced by seller if their seller no is large
" " " " ~~no~~ market where monopoly is there because consumer has no option.

For monopoly,
- if producer ↑ prices ↑ 400, 320, 1010 consumer to shift to other alternatives (shower)



you cannot randomly set prices in monopoly because consumer can find other alternatives too.

12.02

Law of supply :

says that when all other things are at certain level, when a price of a comm. ↑, quantity supplied will be more and vice versa

Cost of prod = 3₹ M. Price = 5₹ you are making a profit of 2₹, so you will try to supply more.
You never know how long you'll be in profit, so you supply more for the time being.

How much you'll supply will mostly depend on m. price. If price is less & you make no profit, you may not even produce, hence supply ↓.

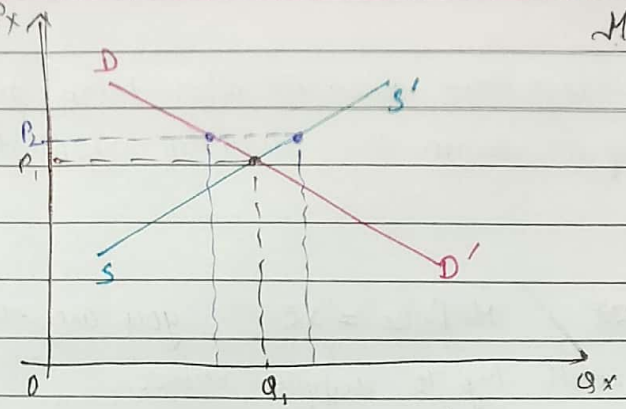
Long term basis, this may not be the same. (not necessarily price determines it)

1. Govt policies changed in such a way that you can no more import. So no more product^n & supply.
2. Technology use - your product^n is more for the same input - hence more supply. (curve shifting)
3. input cost increases but m. price is same, you will reduce production.
4. price of product substitute.

A company making similar types of goods, shift from one unit to another is easy.

For eg- makes refrigerator & AC. In summer, it will shift labour & other resources to make more AC as its price is increasing due to more demand. In winter, it will again shift

Behavioural economics & how people will react to price ↑
what kind of people - afford



(point of eq^m)

Market eq^m -
a state in market when Quant demanded = quant. supplied

In TechM, shopkeeper brings 20 kg tomato, sells all. We can assume that there is no storage facility or it is perishable good.

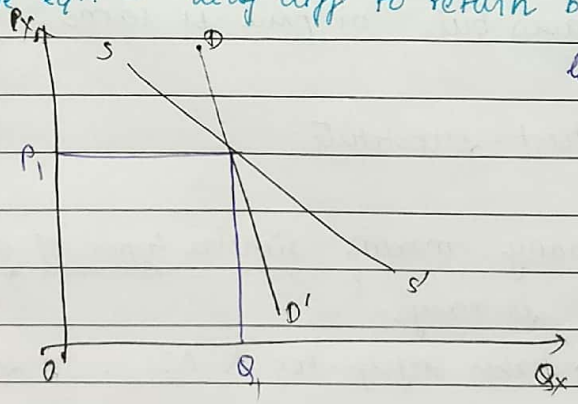
Market eq^m under **static economy** :-
everything is still (~~for~~ for very short time)
↓
no. of organisat^n, consumer's taste, income.

3 diff eq^m in such situations

↳ stable eq^m -

say because of some ext. factor, price ↑ from P_1 to P_2. From graph, demand ↓, supply

↳ unstable eq^m - very diff to return back to eq^m



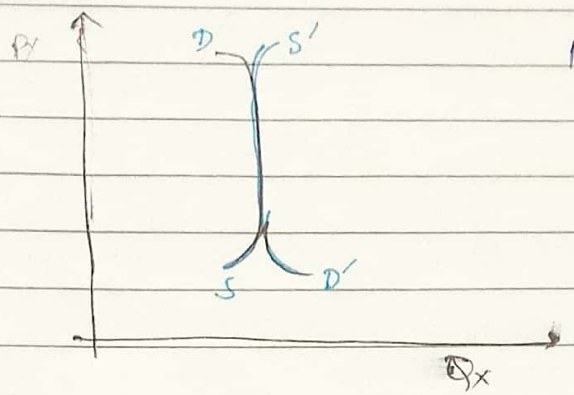
supply -ve sloped

Except^al case
price ↑, you supply less
You are a farmer - produce of 10 quin sold 6 quin, now you suddenly require 4000.
You will have to sell 4 quin
10 Rs per kg.
If price is 20 Rs per kg
You will sell 2 quin.

Hence price ↑, supply ↓ because you know you'll have to buy.

Sick person, needs 4000 Rs. no. of hours worked ↓ when price of each hour ↑

↳ neutral eq^m



price change, no change in D, S for that range.

Dynamic Economy : - for a long time
- everything keeps on changing.

eg - you went to market with 20 £, but came to know that price is 40 £/kg, so you will buy ½ kg. Because you can't afford. On the spot decision.

From supplier side, you took 50 kg thinking 20 £/kg but you came to know it is 40 £/kg. very happy. Next day you'll take more kg to market. Supply is a time lag of price. Today's supply determined by yesterday's price.

Cobb-web theorem:

① Stable eq^m - when (slope)$_D$ < (slope)$_S$ at eq^m now.

Suppose t, P : P_3 → P_6 ⇒ D↓

(tomorrow) t+1, S : S↑, Q_6

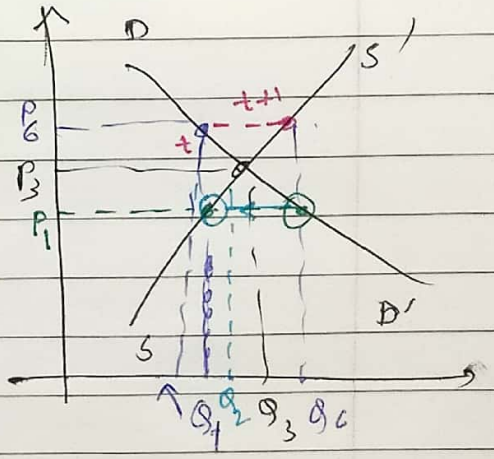
Demand : OQ_1

Supply : OQ_6

Q_1Q_6 unsold stock

excess supply, price will decrease. to P_1

immediately demand ↑ to Q_6



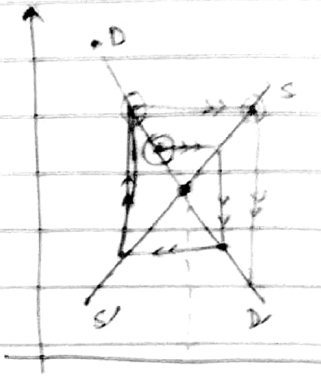
t+2

next day: supply will come to Q_2

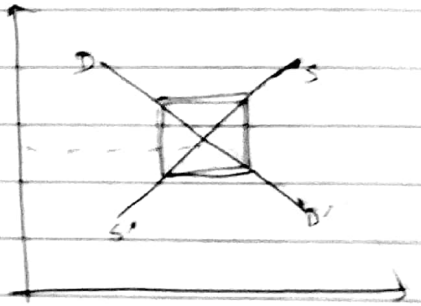
(ii) unstable eqm :

$(\text{slope})_D > (\text{slope})_S$

eqm never reached.



(iii) $(\text{slope})_D = (\text{slope})_S$



Elasticity of demand

If want to maximise profit.

Changing the price will depend on how sensitive my product is towards price change (Price elasticity)
change in demand

(i) Price Elasticity of demand:

$$e_p = \frac{\text{percentage change in Qty demanded}}{\text{\% change in price of same commodity}}$$

If sell a pen for ₹5, demand = 1000, cost of production = ₹3. Hence, total profit = 2000.

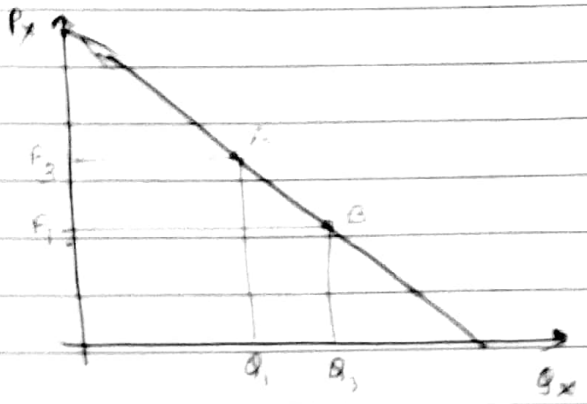
If I increase price to ₹5.5. Demand = 900. But total profit = 900 × 2.5 (increased)

$$e_p = \frac{\Delta Q}{Q} \div \frac{\Delta P}{P}$$

$$= \frac{\Delta Q}{Q} \cdot \frac{P}{\Delta P}$$

$$= \frac{\Delta Q}{\Delta P} \cdot \frac{P}{Q}$$

Arc elasticity: when on changing price, there is considerable change in demand



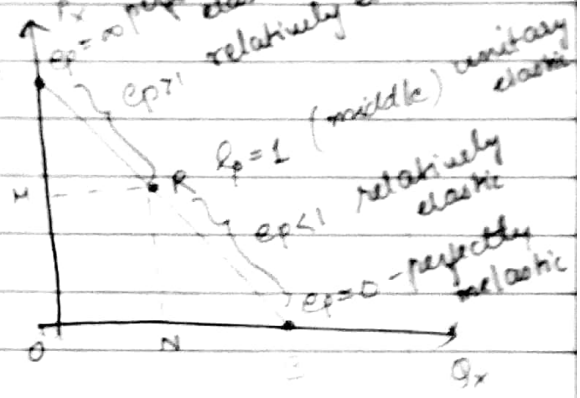
Point elasticity:

$$e_p = -\frac{dQ}{dP} \cdot \frac{P}{Q}$$

is -ve to make e_p +ve, multiplied by - sign

Taking $\frac{dQ}{dP}$ when price change very close to original price

We are interested to measure elasticity at R



$$\frac{dQ}{dP} = \frac{NB}{RN}$$

$$\therefore e_p = \frac{NB}{RN} \cdot \frac{RN}{ON}$$

$$= \frac{NB}{ON}$$

$$= \frac{NB}{MR}$$ similarity of ΔPMR & ΔRNB

$$= \frac{RB}{RA}$$ = lower segment / upper segment

(But this does not give accurate results always)

Profit function: $\Pi = TR - TCost$ (revenue)

$= PQ - TC$ (can be fixed cost, some other)

Total revenue = TR = P.Q

Average revenue: $AR = \frac{P.Q}{Q} = P$

Marginal revenue – change in TR per unit change in Q

$$MR = \frac{d(TR)}{dQ} = \frac{d(P.Q)}{dQ}$$

$$MR = P - Q.\frac{dP}{dQ}$$

$$= P\left(1 + \frac{Q}{P}.\frac{dP}{dQ}\right)$$

$$= P\left(1 - \frac{1}{e}\right)$$

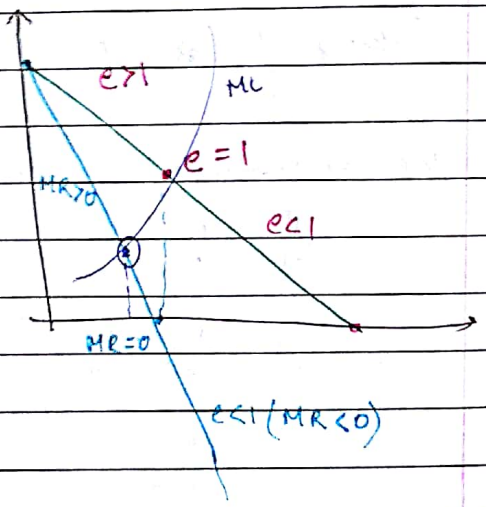
$$\boxed{MR = AR\left(1 - \frac{1}{e}\right)}$$

say $Q = 100 - 5P$

$AR = P = 20 - 0.2Q$ — (I)

$TR = P.Q = 20Q - 0.2Q^2$

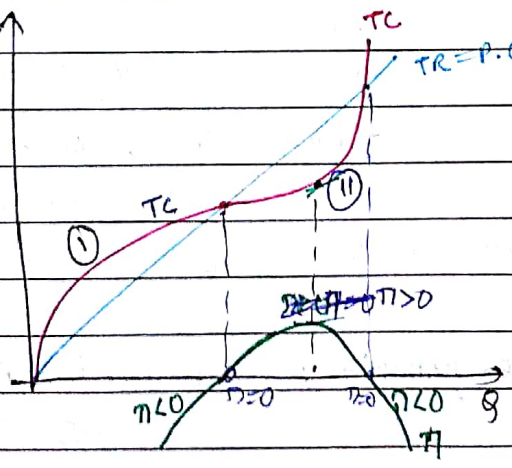
$MR = 20 - 0.4Q$ — (II) $\left(\frac{d(TR)}{dQ}\right)$



Comparing (I) & (II),
slopes different.

(I) TC is more than TR
setting up of industry
so, $\Pi < 0$

(II) Stable production
$TC < TR$
$\Pi > 0$



Factors determining price elasticity :

(i) ~~price of~~ substitute ~~good~~ goods :

Closer the substitute, higher is the elasticity

(ii) nature of good :

essential - less elastic

luxury - highly "

(iii) eg - ~~sugar~~ salt, AC

fraction of income spent - very small fraction - inelastic

very large " - elastic

(iv) Time required to adjust with new price

for salt - 10 to 12 ₹, easily adjusted (inelastic)

AC - highly elastic

(v) no. of alternative uses of that commodity -

eg-milk — ∘ if you use it for many purposes - price increase - you will decrease consumption (elastic)

∘ if your use is limited - inelastic (you can buy the same amount)

more consumptⁿ, more uses means possibility of reducing consumptⁿ is also more.

19.03.18 Income elasticity :

$$e_i = \frac{\% \text{ change in } Q \text{ demanded}}{\% \text{ change in income of consumer}}$$

Relatⁿ is always +ve (normal good)

$$e_i = \frac{dQ}{dM} \cdot \frac{M}{Q}$$

(negative for inferior)

Cross elasticity:

e = % change in qty demanded of a commodity / % change in price of its substitute or complementary

$$e_{t,c} = \frac{dQ_t}{dP_c} \cdot \frac{P_c}{Q_t}$$

(+ve for substitute
-ve for complementary)

Price elasticity of supply:

e_s = % change in quantity supply / % change in price

$$= \frac{dQ_s}{dp} \cdot \frac{p}{Q_s}$$

19.03.14

Production

It is the conversion of input into output, but we add value to it. We in the process of production, we make the product more useful.

Short run - machines
Q- certain variables (inputs) will be fixed, certain variables will be variable.

Long run
no. of employees, spaces, inputs (machines) everything changes.

Fixed - irrespective no. of units produced, they remain fixed
Variable - " " they vary
consumptn of electricity

If you are using plastic, will vary with number.
" " labour for huge product", they'll be more

labour represents all variable inputs

① short run: $Q = f(L, \overline{K})$

(capital), in short run it is fixed
representatn of other variables which are fixed

Long run : $Q = f(L, K)$

everything is variable, except technology
because tech changes in very very long period.

Short run

If I am producing pens, everything (raw materials) are fixed except labour. I am yet to start production, everyday labour is changing.

1 brought in one labour, output started.
1 started adding more labour, output increased.

$$Q = f(L, \overline{K})$$
$$= -L^3 + 15L^2 + 10L$$

Total product (TP) = output = Q [TP_L when we say short run]

average " $(AP_L) = \frac{Q}{L} = \frac{TP}{L}$ (product^n of per ~~level or~~ labour ~~per unit~~ on average basis - individual can be diff)

(MP_L) Marginal product = changing in total output w.r.t change in labour.

10 L, 100 output

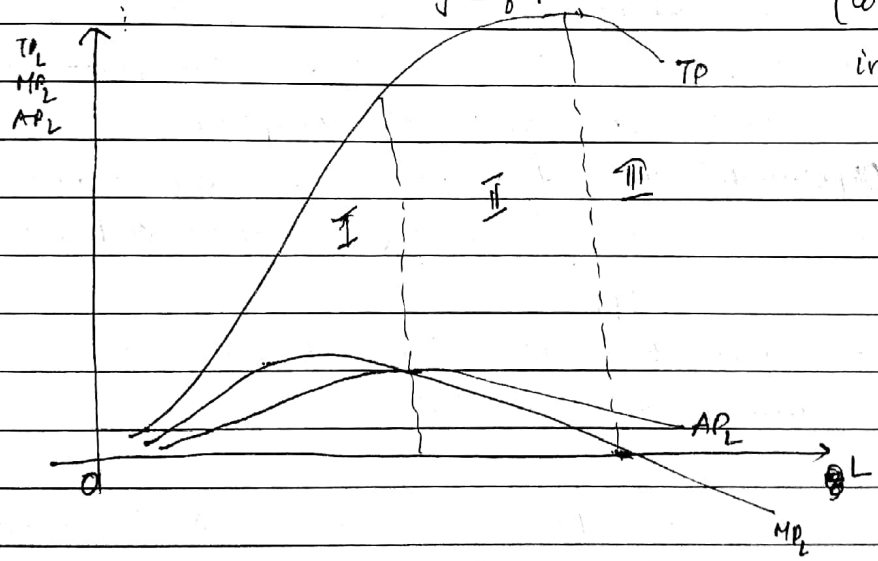
added 11L, 107 "

ch

$$MP_L = \frac{dQ}{dL} = -3L^2 + 30L + 10$$

L	TP = Q	$AP_L = -L^2 + 15L + 10L$	$MP_L = d(-3L^2 + 30L + 10)$
1			
2			
3			
4			

3 stages of production (considering one ~~variable~~ input is variable)



Variable input may be diff from labour. eg- fertilisers in case of agriculture

I: TP_L, MP_L is also increasing, MP_L increases and reaches max^m in stage I itself.
Total product increasing at an increasing rate.
MP_L starts decreasing in I itself.
Throughout, AP_L is increasing
It ends when AP_L is max^m or $AP_L = MP_L$

II. starts from $AP_L = MP_L$. Both start decreasing.
But MP_L decreases more than AP_L
Ends when $MP_L = 0$.
Corresp. TP is max^m.

III. MP_L is negative
TP starts decreasing.

Q Which stage are you producing & why?

IIIrd stage: On adding labour, total prod. decreases.

Ist stage: TP is not important when you are producing proportionally. You cannot produce endlessly if ∄ labour is contributing more & more.

- You will be concerned about labour cost (say 500)
- how much that labour will contribute (<, >, = 500)
  ($MP_L = 0$ or decreasing means you are producing paying 500 but labour gives 300 output)
- Opportunity cost - ∄ utilise this labour somewhere else they may produce 1000. But I am losing opportunity
- In complex product^n system, not possible to measure each & every person's contribut^n.

* We are concerned about- AP_L. As long as AP ↑, average cost of product^n is decreasing. As long as, AP ↑, we can add more & more labour.

But practically, we don't use graph but comparison with previous cases. A stage will come when AP_L decreases with 1 unit addit^n of labour. You realise ~~wa~~ your AP was max^m earlier.

Hence, when AP_L is max^m, you are producing.

20.03.18

Optimization Techniques : Linear Programming

Objective
producer - maximise profit, utility maximisation

Sometimes, our objective may not be profit maximisation, expressing in different way - minimise cost.
Resource
But, we face many constraints while producing like space, land, capital Limitedness (~~resource~~ comes into picture.
Although it may be possible to produce more but we're looking for max^m profit under resource constraints.

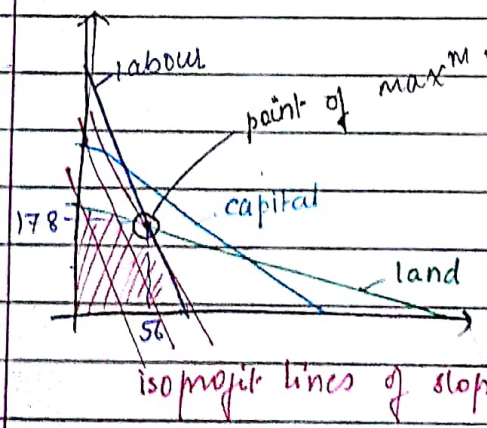
Constraints - linear

When your market share is low, you're a price taker not a maker.
(i) So, you don't have an upper limit and you can produce as much as you want for profit maximisat^n

(ii) When no upper limit, you minimise cost to increase profit.

When market is competitive, you cannot sell unlimited no. of product

How is never answered.
It tells you can use x labour to produce y products but does not tell how you will implement it.



$4X + 1Y \leq 400$
$1X + 1Y \leq 300$
$2X + 5Y \leq 1000$
} technical constraints

$X \geq 0$, $Y \geq 0$
} non-negativity

Objective function: $\pi = \pi_x X + \pi_y Y$
$= 2X + 1Y$
slope of isoprofit line

Dual problem in this case is minimising cost

If primal converted to dual, we've ≤ eqⁿ in form of x & other in y

Imputed costs - / opportunity cost (similar to shadow prices)

I'm utilising my family members as labour and not paying them.

return from the next best alternative you are choosing

labour huge - output 300

somewhere else - output 500

If I am utilising here, I'm sacrificing 500

opportunity cost of labour is

return from business investment

" " saving in bank

Opportunity cost of

Page No.:
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Contd... Production

Law of diminishing marginal return: When more and more units of a variable input is added to a certain amount of fixed input output initially increases at an increasing rate, then output will increase at a constant rate, then output will increase at a decreasing rate.

Labour

Q has nothing to do with the graph.

Last stage → When you add more & more fertiliser to your crop, because of more toxicity, output will decrease

(i) When you add 20 labour when you required 10, the extra 10 will indulge in non-productive activities like trade unions, gossiping. Hence, output will decrease.

(ii) LONG RUN:

nothing is fixed except- technology
capital, labour

Real life → In irrigation — HYV, Oirigation, (machine + animal) labour, machines

[many factors]

Say, we increase all the inputs by 100%. Output will increase. The amount of increase will depend on the position we are at

Cobb-Douglas

$$Q = AK^{\alpha} L^{\beta}$$

in most of the cases, $\alpha + \beta = 1$ have been found

Why this form?

Suppose I increase input by k times, then Q increases h times

$$hQ = A(kK)^{\alpha} (kL)^{\beta}$$

$hQ = h^{\alpha+\beta} A K^{\alpha} L^{\beta}$

If $\alpha+\beta = 1$, then $h = k$ ⇒ output will increase by same proportion as input.

law of constant returns to scale.

10 – 20 – 30 –

output is increasing in all cases

$\alpha+\beta > 1$, $h > k$ law of increasing returns to scale

10 – 20 – 50 – 100 – 200

$\alpha+\beta < 1$, $h < k$ law of decreasing returns to scale

↑ laws of returns to scale

II

machine	1	2	4
labour	5	10	20

one labour doing

there is division of labour in this case, hence more specialised

⇒ more output.

III (i) fisherman. you're increasing your nets & other equipments output will not necessarily increase due to less no. of fish.

(ii) mining – you were earlier mining in a shallow area. Now you are mining in very deep areas, may not get same output.

Q may not be continuous. It can be binary. I want to know, based on no. of factors, the economic behaviour of a person the output will be either 0 or 1.

not E entrepreneur

factors like risk taking, income, etc.

By default, we assume $\alpha + \beta = 1$ constant returns to scale

Properties (i) Short run, MP, AP dependent on L only

But here, it depends on both L & K.

$$MP_K \text{ w.r.t } K = \frac{dQ}{dK} = \alpha A K^{\alpha-1} L^{\beta}$$

$$= \alpha A K^{\alpha-1} L^{1-\alpha}$$

$$= \alpha A \left(\frac{K}{L}\right)^{\alpha-1}$$ it depends on both

$$MP_L = \frac{dQ}{dL} = \beta A K^{\alpha} L^{\beta-1}$$

$$= \beta A K^{1-\beta} L^{\beta-1}$$

$$= \beta A \left(\frac{L}{K}\right)^{\beta-1}$$

(ii) we can use log also to express this eqn. Because L can be in small numbers but capital is in millions...

$$\log Q = \log A + \alpha \log K + \beta \log L$$

what are α, β — elasticity.

Elasticity of output w.r.t capital $e = \frac{dQ}{dK} \cdot \frac{K}{Q}$

$$= \alpha A K^{\alpha-1} L^{\beta} \cdot \frac{K}{Q}$$

$$= \frac{\alpha A K^{\alpha} L^{\beta}}{Q}$$

$$= \alpha$$

Elasticity of output w.r.t capital $= \alpha$

Elasticity of output w.r.t labour $= \frac{dQ}{dL} \cdot \frac{L}{Q} = \beta A K^{\alpha} L^{\beta-1} \cdot \frac{L}{Q}$

$$= \beta$$

Linear form: to calculate e, we need to calculate $\frac{dQ}{dK}$ then one more step.

But Cobb Douglas form. $Q = A K^{0.8} L^{0.5}$ $\alpha+\beta > 1$

$Q = A K^{0.2} L^{0.8} La^{0.5}$

$\alpha+\beta+\gamma > 1$

there can be more inputs

If I increase K by 1%, Q will increase by 0.8%.

We use different forms of eq^n to get required form of curves = best fit curves.

Sometimes, we may also be interested to know intensity of adoption. To what extent, how frequently technology is adopted and not just how many are adopting it. Accordingly, we use different models.

iv) Cobb-Douglas f^n is homogeneous and level of homogeneity is dependent on $\alpha+\beta$. (sum of its exponents)

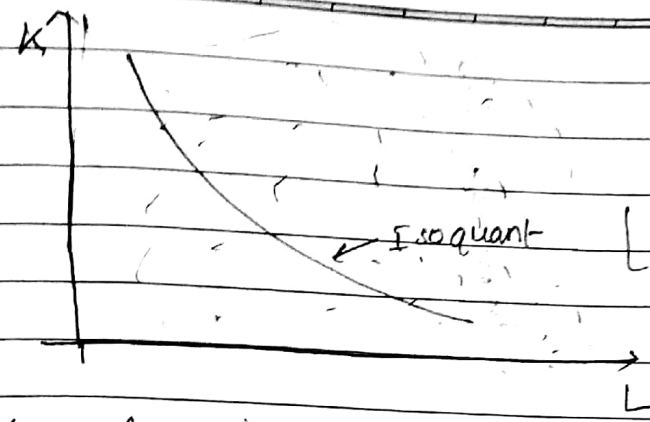
Product^n depends on certain assumptions:

(i) Technology is constant (short & long run both)
(ii) Input price is not changing.
(iii) SR - labour variable, ~~LR~~ => one input is inelastic in nature eg - capital
LR - .
(iv) You can use a small quantity of labour & K to produce a small quantity of output.
↓
Cobb f^n is continuous. It is divisible. You can produce small output using small quantity of labour & say, you ~~dont~~ do not have some raw material. When you bring some amt, you produce some amount.

v) α, β represent distributive share on ~~capital~~ output w.r.t labour, capital

- more & more fertiliser — lodging
  shoot stronger, root unable to support
  then toxicity.

Divisibility: on adding 1 labour in thousands, it can be considered small. We do not do it practically but possibility told.

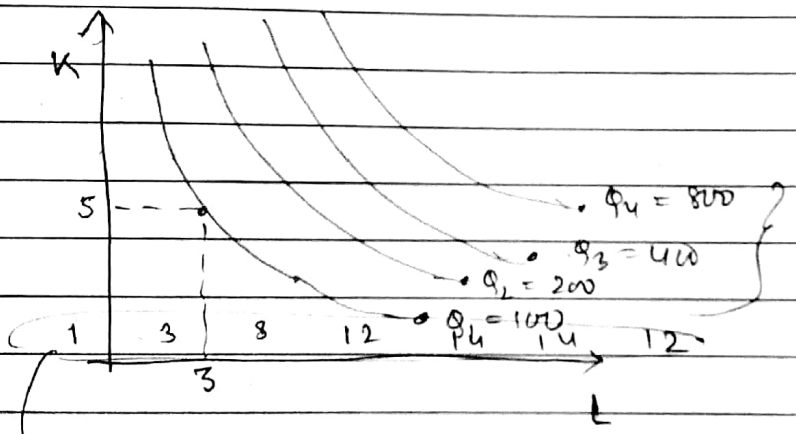


[joining those points where output is same]

Locus of points that represent diff. combination of (labour & capital) or two inputs where level of output is same.

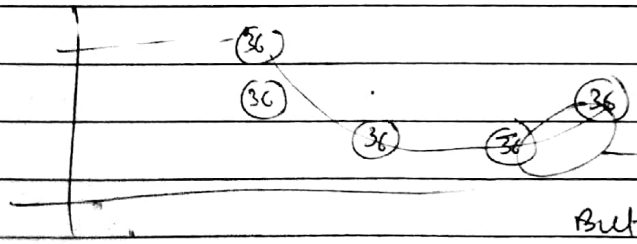
Properties:

i) negatively sloped
ii) convex towards origin
iii) never intersect
iv) higher isoquant means higher level of output



represents constant returns to scale.

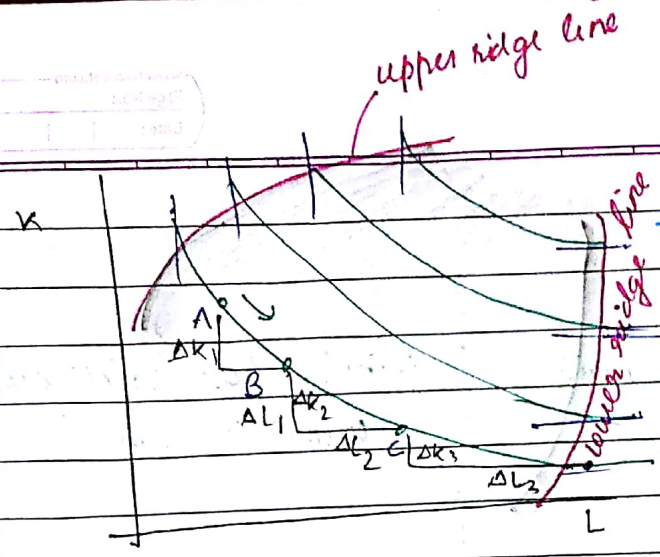
keeping K fixed, see the trend of L, follows law of diminishing marginal return.



but will ignore this.

positively sloped.

But if I ~~am~~ am a rational producer, my decision should be technically efficient, no under utilisat^n of resources. I can produce 36 from less labour also. So, I will not go for more



Marginal rate of technical substitut^n – rate at which one input substituted with other.

$$\frac{\Delta K_1}{\Delta L_1} > \frac{\Delta K_2}{\Delta L_2} > \frac{\Delta K_3}{\Delta L_3}$$

Every isoquant has 2 extreme points.
If we join all extreme points, we get 2 curves which separate +vely & -vely sloped curves.
Now, we are silent about ~~no~~ budget, depending on which isoquant we choose. But, here we will obviously use -vely part

Area b/w upper & lower ridge line is called economic region of product^n. Technical efficiency is more.

Like consumer's eq^m, here we get the best point with minimum input to produce same level of output.

L.P: $C = P_L \cdot L + P_K \cdot K$

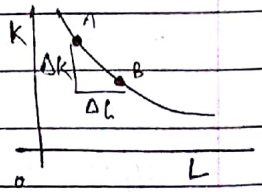
If P_L, P_K given, we can find Budget line
Point of tangency of this with isoquant will be best combinat^n.

03.04

$-\Delta K\, MP_K$ is total loss in product^n due to change in ~~labour~~ capital

∴ To ~~get~~ get same product^n, we must substitute by labour

$$-\Delta K\, MP_K = \Delta L \cdot MP_L$$



Marginal rate of technical substitut^n	$= -\frac{\Delta K}{\Delta L} = \frac{MP_L}{MP_K}$

But there's a limit

We cannot substitute one for other by 100%.
Even if my product" is labour-intensive

I cannot replace capital fully by labour because atleast one is needed to start the machine

Cost (Do not compare one other but one written with other)

I) Actual cost: all kinds of cost I am incurring in business.

Opportunity cost - not actually a cost. It is the return from the next best alternative you are sacrificing because of your present expenditure.) alternative / business.

Labour in different works outputs is are 500, 300, 200.

II) Business cost: all kinds of cost I'm incurring in business.

Full cost = business cost + opp. cost + minimal/normal margin

normal margin - the minimum amount of profit you expect to remain in business.

If your return is less than this, you will no more invest there.

III) Explicit & implicit cost - not actually incurred.

similar to opportunity cost

actually what you are incurring

I'm owner & manager of same company. Had I worked somewhere else, I could produce more.
I you need to deduct managerial cost, otherwise I'm overestimating profit.

Imputed / implicit value of family labour.

IV) Private and social cost -

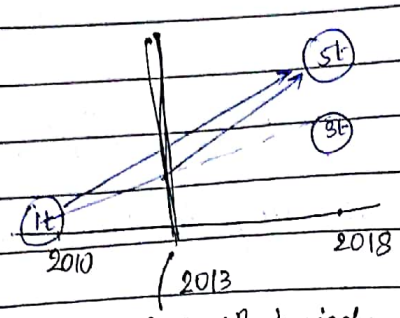
whatever I'm actually using to produce

(social cost = private + external cost

I'm producing pens dumping waste in a river.

people fall sick. The whole society has to bear that cost.

we cannot tell that it increased purely because of the project.



Short run

$TC = 100 + 50Q - 20Q^2 + 5Q^3$

(100: TFC, fixed cost; $50Q - 20Q^2 + 5Q^3$: TVC)

Total cost depends on how much you're producing.

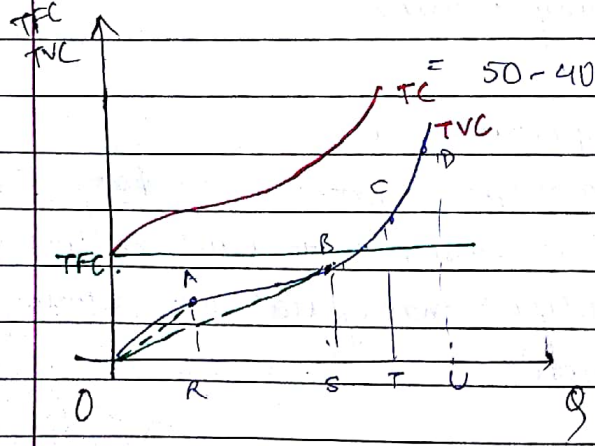
TC = Total fixed cost + TVC

$$\text{Average cost} = \frac{TC}{Q} = \frac{100}{Q} + 50 - 20Q + 5Q^2$$

$\frac{100}{Q}$: AFC $= \frac{TFC}{Q}$; $50 - 20Q + 5Q^2$: AVC $= \frac{TVC}{Q}$

$$\text{Marginal cost} = \frac{dTC}{dQ}$$

additional cost due to addition of one unit.

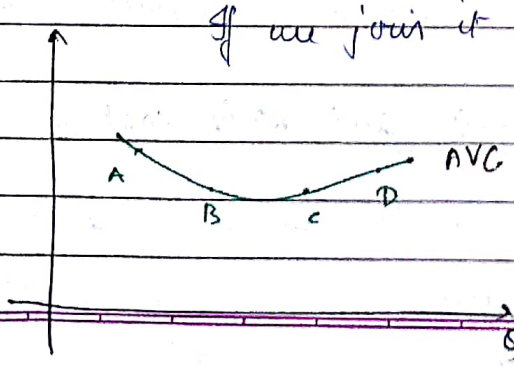


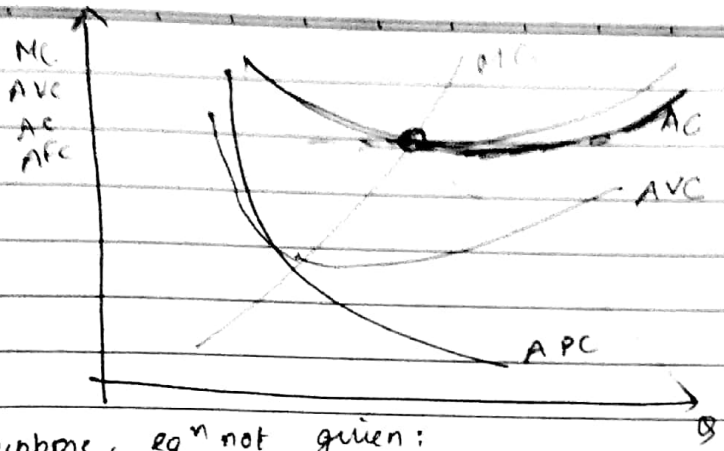
At A, $AVC|_A = \frac{OA}{OR}$

$AVC|_B = \frac{OB}{OS}$ (less than at A)

at C it again increases

If we join it





suppose, eqn not given:

(i) suppose I want to see relatn b/w MC & AC, so I convert TC into AC. [TC = AC · Q]

$$MC = \frac{d(TC)}{dQ}$$

$$= \frac{d(AC \cdot Q)}{dQ} = AC + Q \cdot \frac{dAC}{dQ} = MC$$

$$\Rightarrow \frac{dAC}{dQ} = \frac{1}{Q}[MC - AC]$$

There are possibilities:

i) MC < AC, RHS ⇒ -ve

∴ slope of AC curve is -ve.

ii) MC = AC, slope = 0

iii) MC > AC, slope > 0

MC curve touches AC curve at its minimum value.