16/9/24

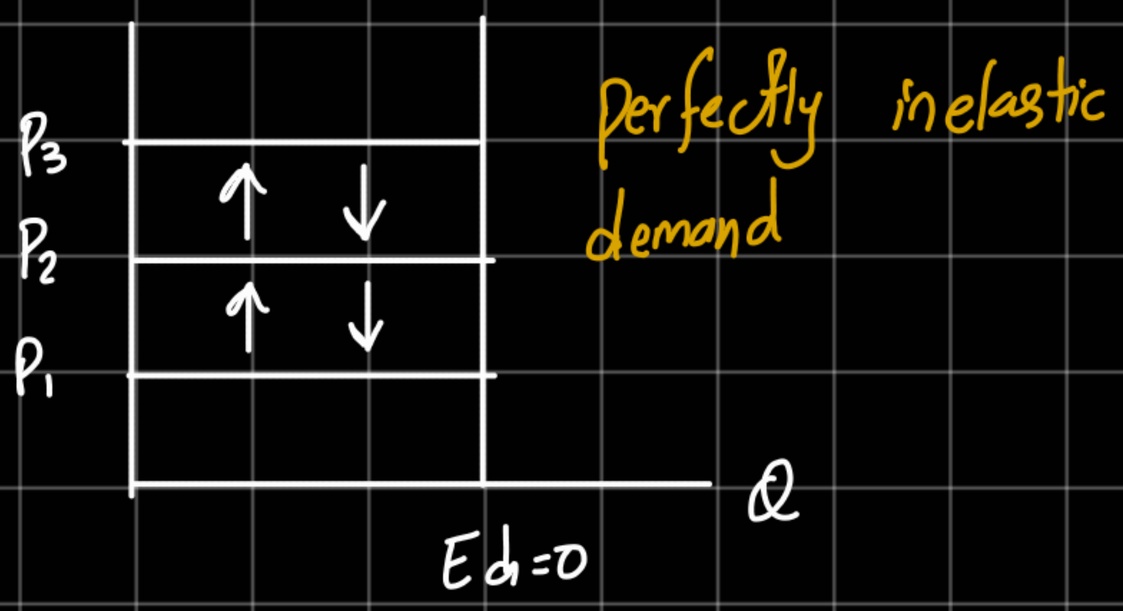
Elasticity of demand

elasticity refers to the modified response of the customer due to the price change or any other factor of demand.

$$Ed = \frac{\%\ \Delta Q_D}{\%\ \Delta P}$$ Elasticity is a measured response to the price change

$$Edy = \frac{\%\ \Delta Q_D}{\%\ \Delta Y}$$ ← income

1) Perfectly inelastic demand
2) Relatively in elastic demand
3) Perfectly elastic demand
4) Relatively elastic demand



Perfectly inelastic demand

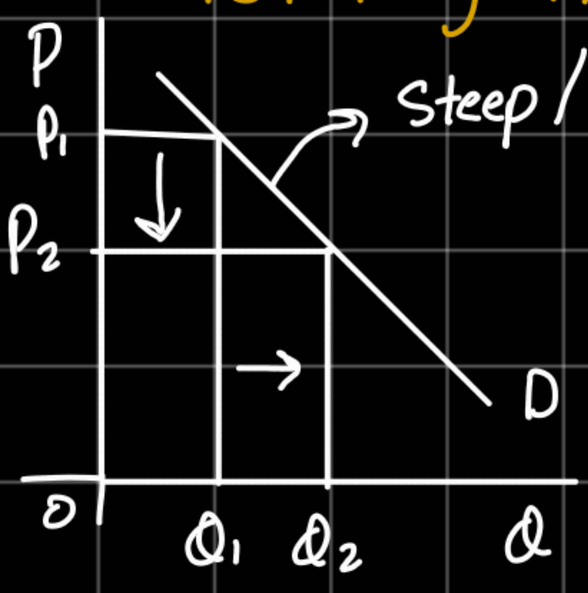
$\bar{Q}$

Cancer sessions
chemotherapy sessions
radio therapy sessions

] important & have to do must or nothing

relatively inelastic demand

$Ed < 1$

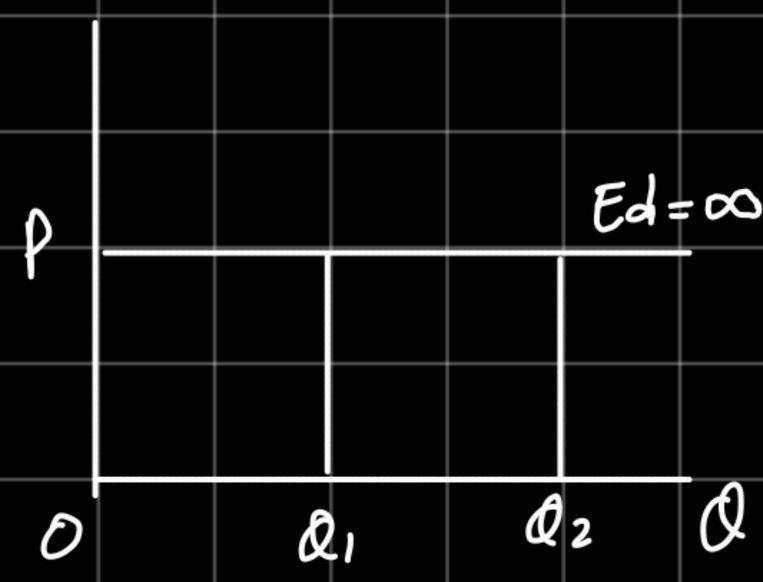


$\Delta P > \Delta Q$

- necessities
- medicals
- apparels
- fuel (kinda)

important but have alternatives but less options

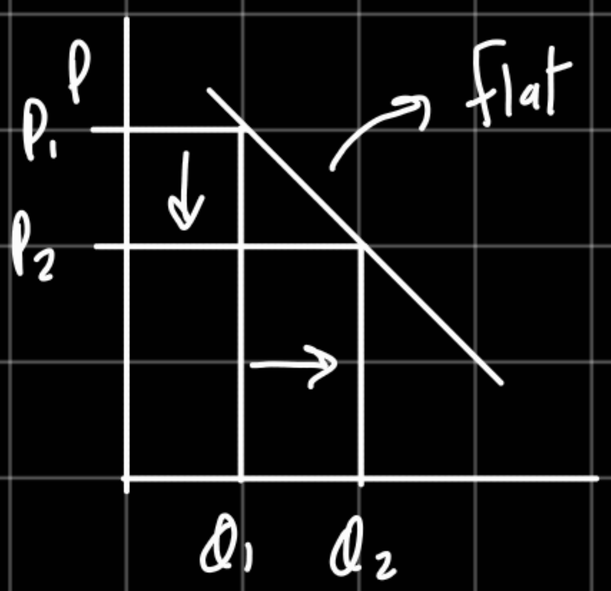
Perfectly elastic demand



Salt — alot of manufacturing even though required but price same

Relatively Elastic demand

$\Delta Q > \Delta P$ $Ed > 1$



Luxuries
pencils
wristwatch

something not really needed

Types

1) Arc price elasticity
2) income elasticity
3) point elasticity
4) cross elasticity
5) advertising elasticity

$$\varepsilon_{arc} = \frac{\frac{Q_2 - Q_1}{\frac{Q_2+Q_1}{2}}}{\frac{P_2 - P_1}{\frac{P_2+P_1}{2}}}$$

$$\varepsilon_y = \frac{\frac{Q_2 - Q_1}{\frac{Q_2+Q_1}{2}}}{\frac{Y_2 - Y_1}{\frac{Y_2+Y_1}{2}}}$$

Point elasticity

- Point price elasticity
- Point income elasticity

$$Q = 20 - 2P + 0.5Y$$

$$\varepsilon_{PT} = \frac{\Delta Q}{\Delta P} \times \frac{P}{Q}$$

$$= -2 \times \frac{P}{Q}$$

$$\varepsilon_{PT_Y} = \frac{\Delta Q}{\Delta Y} \times \frac{Y}{Q}$$

$$= 0.5 \times \frac{Y}{Q}$$

$$\varepsilon_{\substack{cross \\ AB}} = \frac{\frac{Q_{2A} - Q_{1A}}{\frac{Q_{2A}}{2} + Q_{1A}}}{\frac{P_{2B} - P_{1B}}{\frac{P_{2B} + P_{1B}}{2}}}$$

A & B can be substitutes
 || || || complements

$$\varepsilon_{ad} = \frac{\%\,\Delta Qd}{\%\,\Delta AD}$$

$\varepsilon_d = 1$

unitary

$\boxed{\Delta Q = \Delta P}$

$\varepsilon_d > 1$ relatively elastic demand

$\Delta Q > \Delta P$

$\varepsilon_d < 1$ relatively inelastic demand

$\Delta P > \Delta Q$

$\varepsilon_d = 0$

perfectly inelastic demand

$\varepsilon_d = \infty$

perfectly elastic demand

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Cross elasitcity is +ve when products are substitute
" " " -ve when products are complements
" " " 0 for non related products

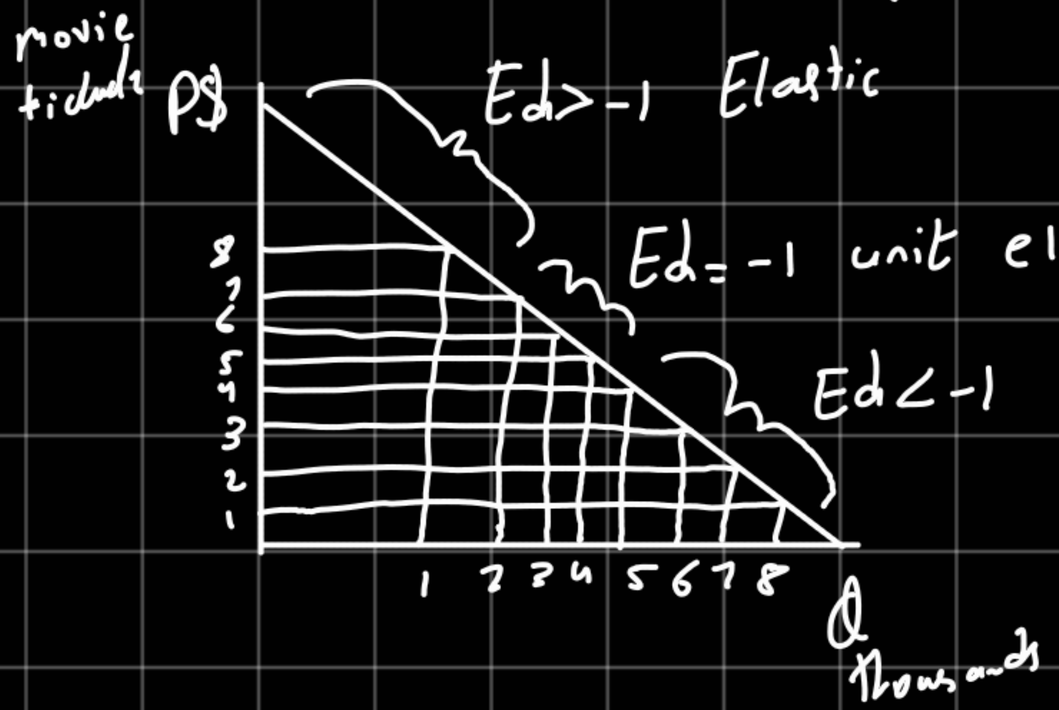
Demand elasticity

Total revenue and elasticity test

total revenue = price x Quantity

$$\text{Elasticity} = \frac{\%\ \Delta Q_D}{\%\ \Delta P}$$

↳ modified response of the individual to the price



P x Q		T_r
8 x 1	=	8000
7 x 2	=	14000
6 x 3	=	18000
5 x 4	=	20000
4 x 5	=	20000
3 x 6	=	18000
2 x 7	=	14000
1 x 8	=	8000

$T_r \uparrow$ P↓ $\varepsilon d > -1$

$\overline{T_r}$ P↓ $\varepsilon d = -1$

$T_r \downarrow$ P↓ $\varepsilon d < -1$

$Ed > -1$	$Ed = -1$	$Ed < -1$
$Tr\uparrow P\downarrow$	$\overline{Tr}\ P\updownarrow$	$Tr\downarrow P\downarrow$
$Tr\downarrow P\uparrow$	$\overline{Tr}\ P\downarrow$	$Tr\uparrow P\uparrow$
$\Delta P < \Delta Q$	$\Delta P = \Delta Q$	$\Delta P > \Delta Q$

Pg 100

Q7 def Q8 Q9 Q10

Q7) d)

Point income elasticity

$$\epsilon_{pT} = \text{Slope} \times \frac{P}{Q}$$

Q8) cap = 80k

avg = 50k

P_{avg} = 30Rs

if $\epsilon_p = -1$ $P = ?$

if P = 27 Rs avg = 60k $\epsilon_p = ?$

$$-1 = -\frac{3}{5000} \frac{P}{80000}$$

$$-1 = \frac{3P}{400} \qquad P = 133M$$

27/9/24

utility maximization rule (R)

inorder to maximize utility the consumer should allocate (Pr) his money / income (B) in a manner that the last dollar spent on each good yields equal utility per dollar

Assumptions of Consumer behaviour

1) rationality
2) prices
3) preferences
4) budget Constraint

$$M = P_a \cdot A + P_b \cdot B$$

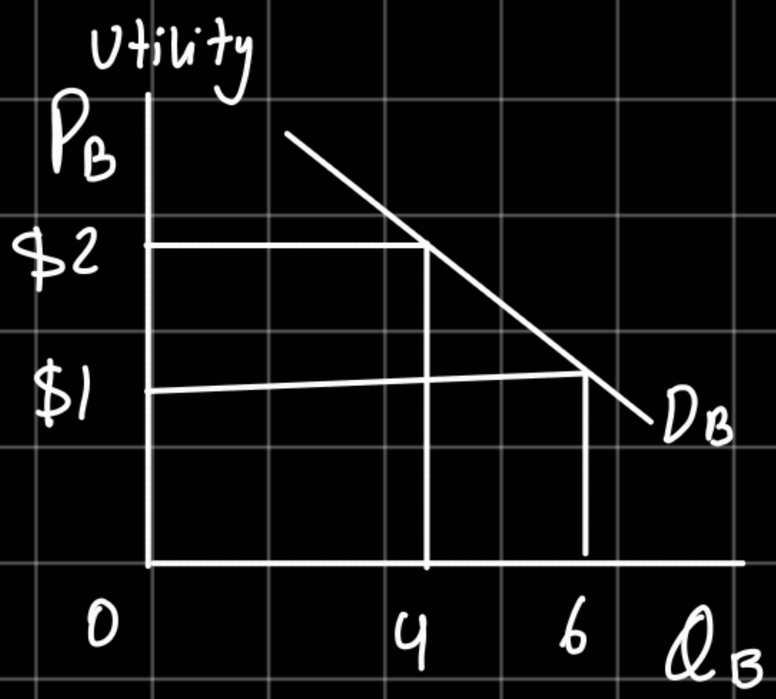
utility per dollar

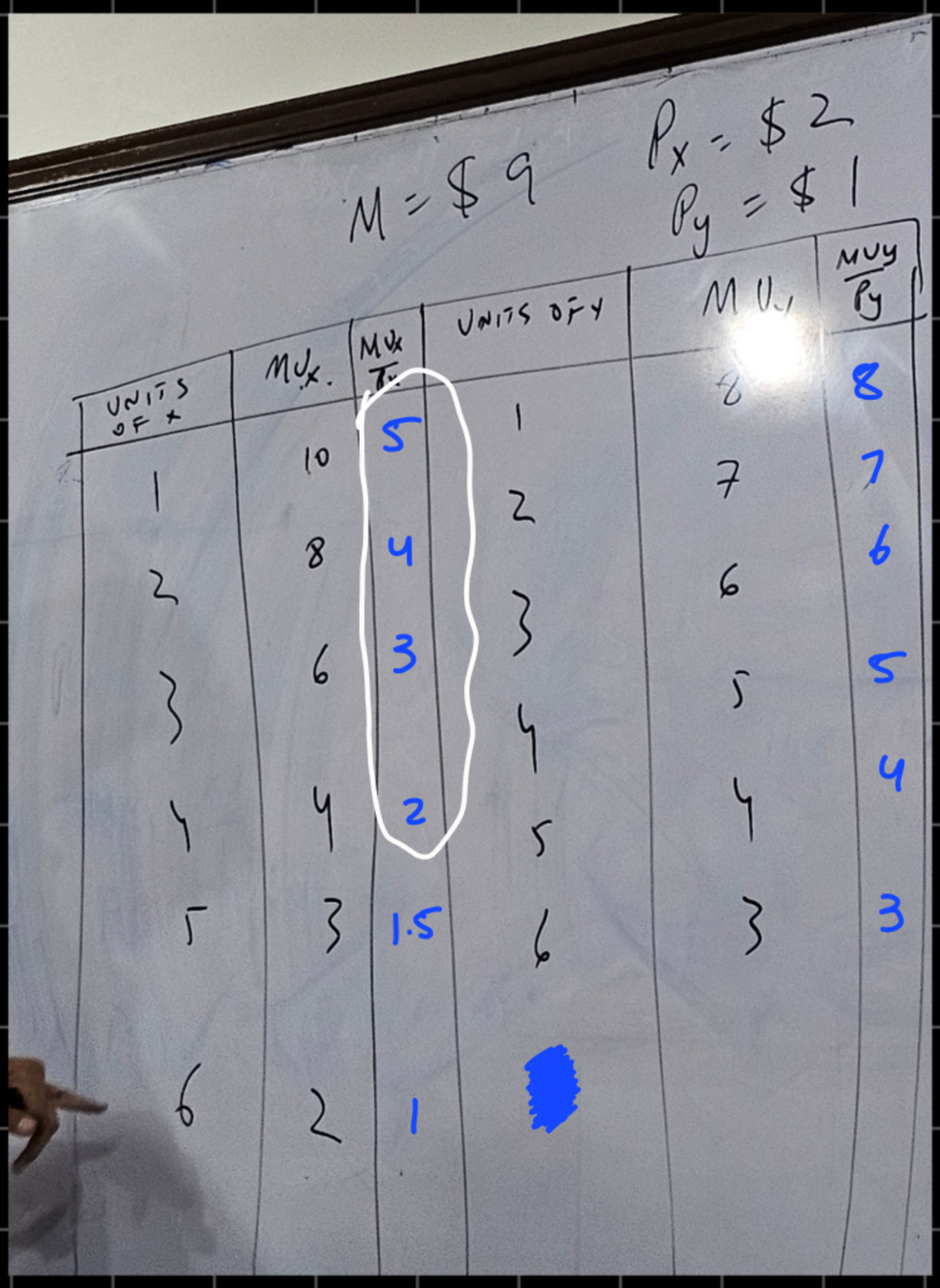
$$= \frac{mu}{P}$$

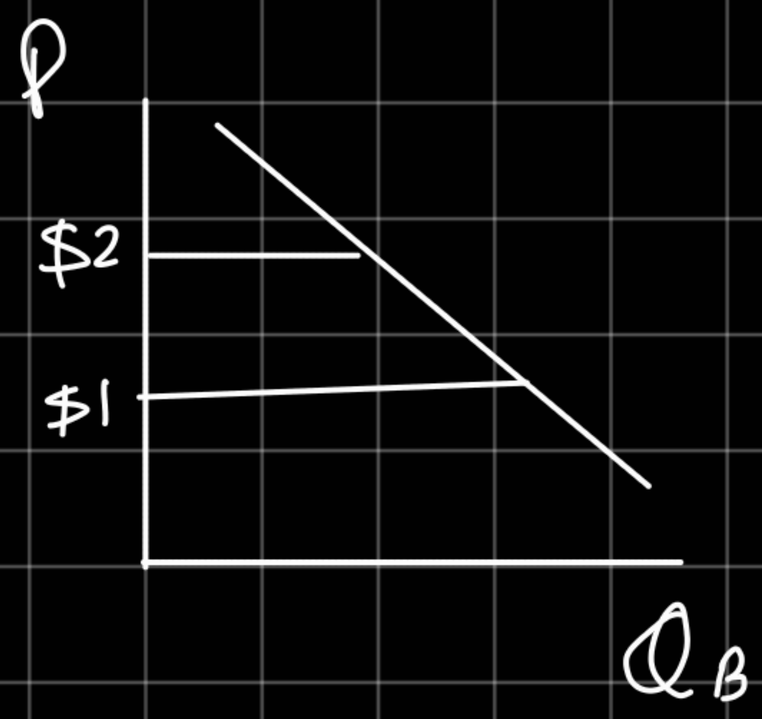
$M = \$10$ $P_a = \$1$, $P_b = \$2$

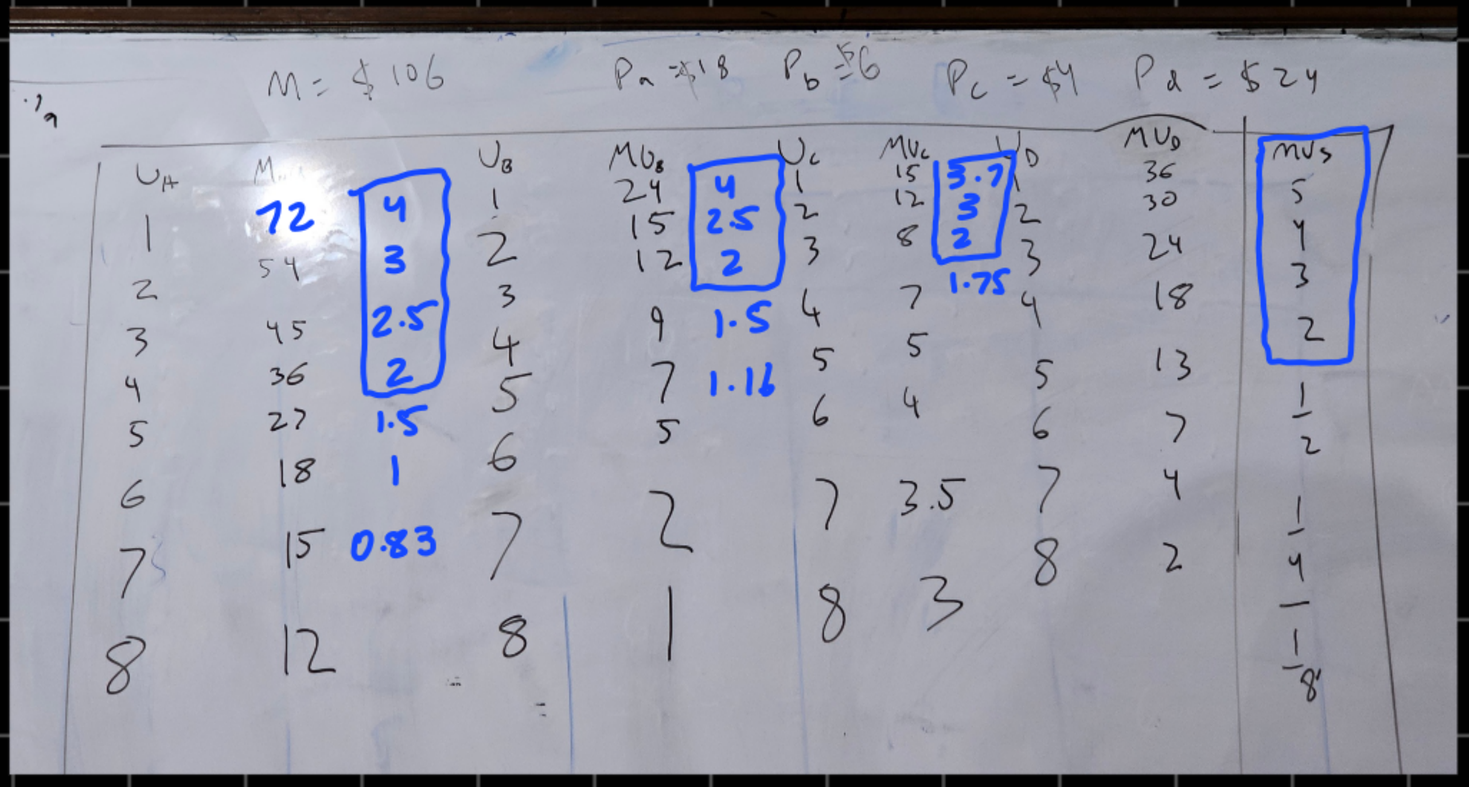
unit of product	MU_a	MU_a/P_a	MU_b	MU_b/P_b
1	10	10	24	12
2	8	8	20	10
3	7	7	18	9
4	6	6	16	8
5	5	5	12	6
6	4	4	6	3
7	3	3	4	2

$2 + $8 = $10









$18 \times 3 = 72$
$6 \times 3 = 18$
$4 \times 3 = 12$
102
4
106

30/9/24

Utility maximization rule

$10 in the total budget

$Mu_a = Z = 10 - x$ — ①

$Mu_b = Z = 21 - 2y$ — ②

$x + y = 10$

Z marginal utility per dollar

x is the amount spent on A

y " " " " on B

Compare ① & ②

$10 - x = 21 - 2y$

$-x + 2y = 21 - 10$

$\boxed{-x + 2y = 11}$ — ③

$x + y = 10$

$-x + y = 11$

$3y = 21$

$\boxed{y = 7}$

$x = 3$

$MU_a = MU_b = Z$

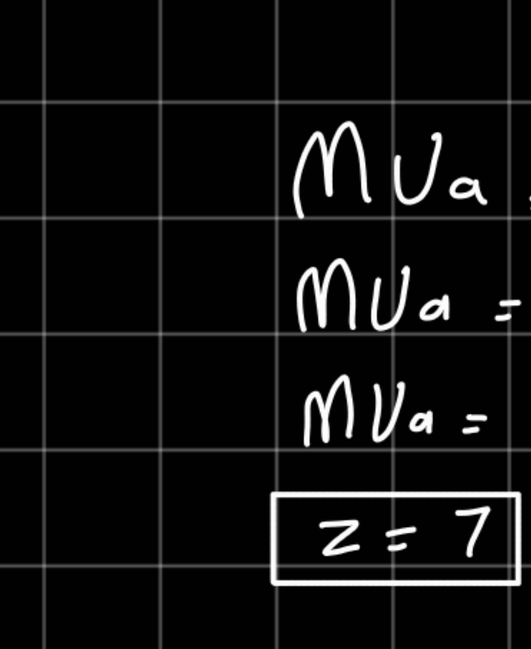
$MU_a = MU_b = 7$

$MU_a = Z = 10 - 3$

$\boxed{Z = 7}$

Budget line

objective/cardinal approach to utility



$M = P_a \cdot A + P_b \cdot B$

$M = \$12$

$P_a = \$1.5$

$P_b = \$1$

max of $A = \frac{12}{1.5} = 8$

max of $B = \frac{12}{1} = 12$

$$\text{Max of } A = \frac{M}{P_a}, \quad \text{Max of } B = \frac{M}{P_b}$$

Budget line is a curve which shows objectively various combination of 2 goods which the indivinal can consume in limited income.

$$M = (1.5)(8) + (1)(0)$$

$$M = (1.5)(0) + (1)(12)$$

$$\text{Slope} = -\frac{P_B}{P_a}$$

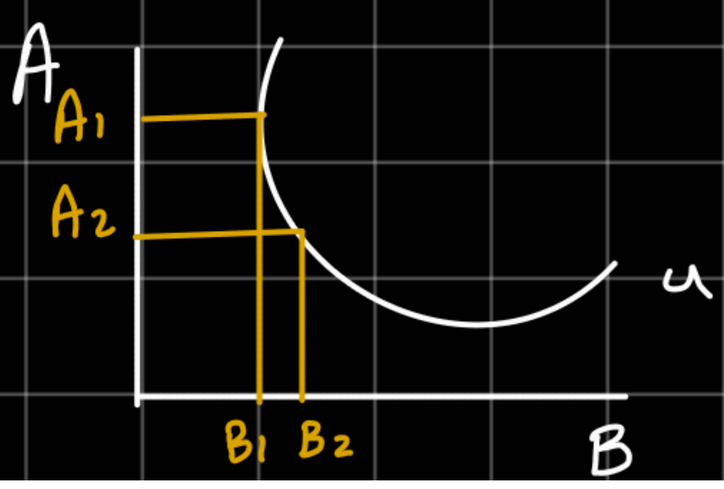
$$= -\frac{1}{1.5} = -\frac{2}{3}$$

A	B	$M = P_a \cdot A + P_b \cdot B$
8	0	$12 = 1.5 \times 8 + 1 \times 0$
6	3	$12 = 1.5 \times 6 + 1 \times 3$
4	6	$12 = 1.5 \times 4 + 1 \times 6$ → optimal
2	9	$12 = 1.5 \times 2 + 1 \times 9$
0	12	$12 = 1.5 \times 0 + 1 \times 12$

$6 + 6 = 12$

Indifference curve

it is the focus of points which shows various combination of two goods subjectively



A ↑ TU↑ MU↓
B ↓ MU↑ TU↓

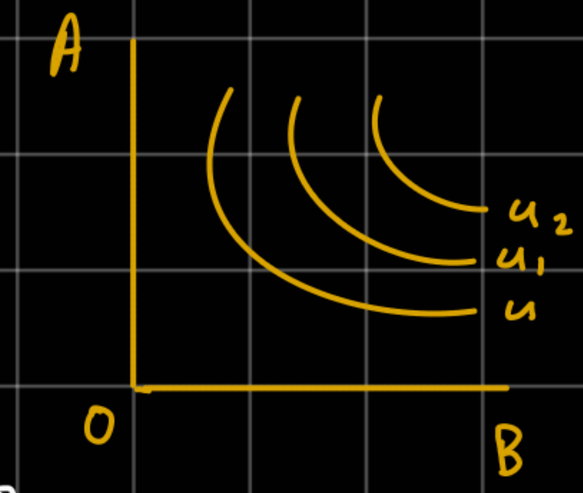
Law of diminishing utility

MRS (marginal rate of substitution)

Properties

1) convex to origin
2) indifference map
3) Consumer's equilibrium

Q1) why convex why not concave?

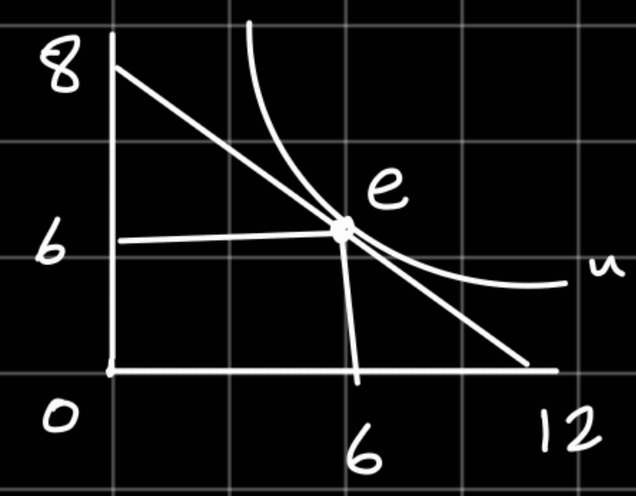


Total utility of
$T_u\, u < T_u\, u_1 < T_u\, u_2$

Consumer's Equilibrium

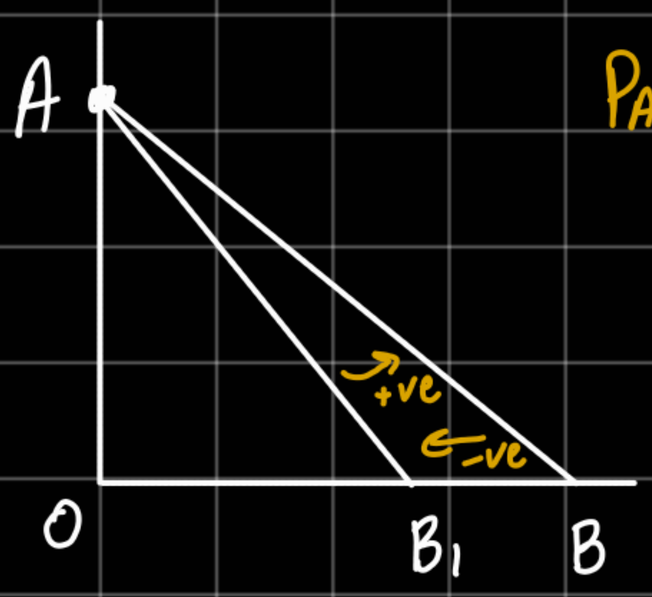
Slope of Budget line
= marginal rate of substitution

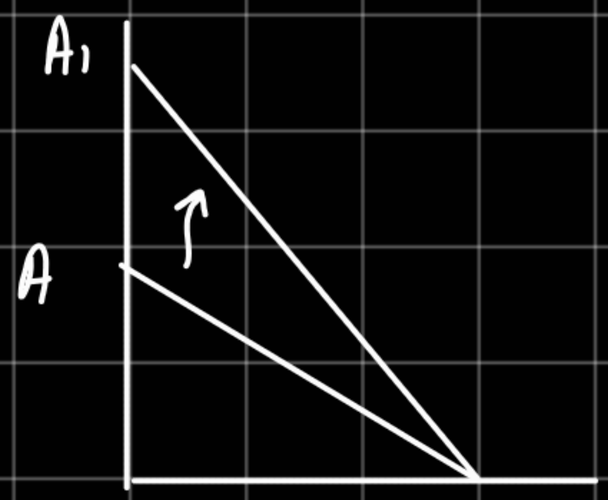
$$-\frac{P_B}{P_A} = MRS$$

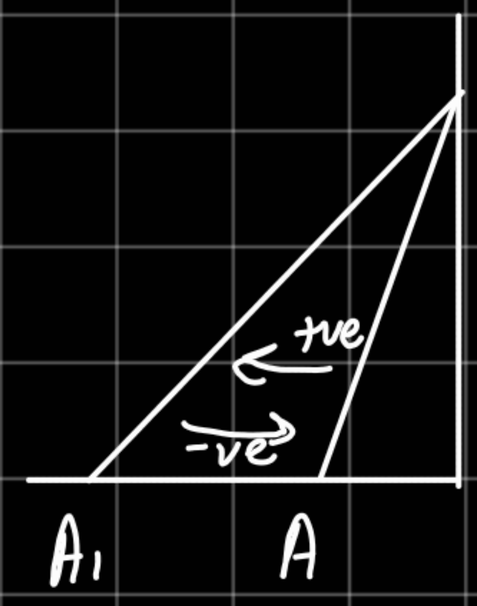


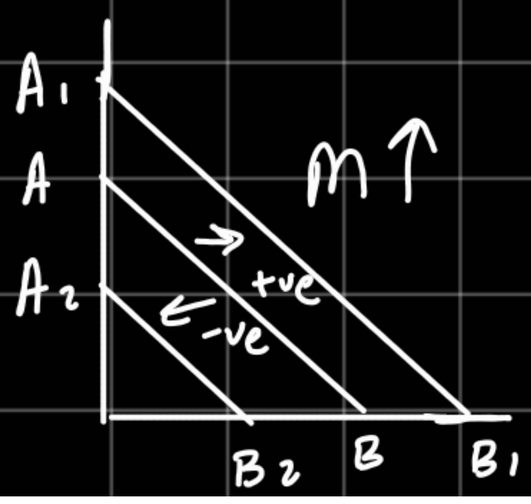
Properties of budget Line

1) it can rotate on either axis
2) it can parallely shift.





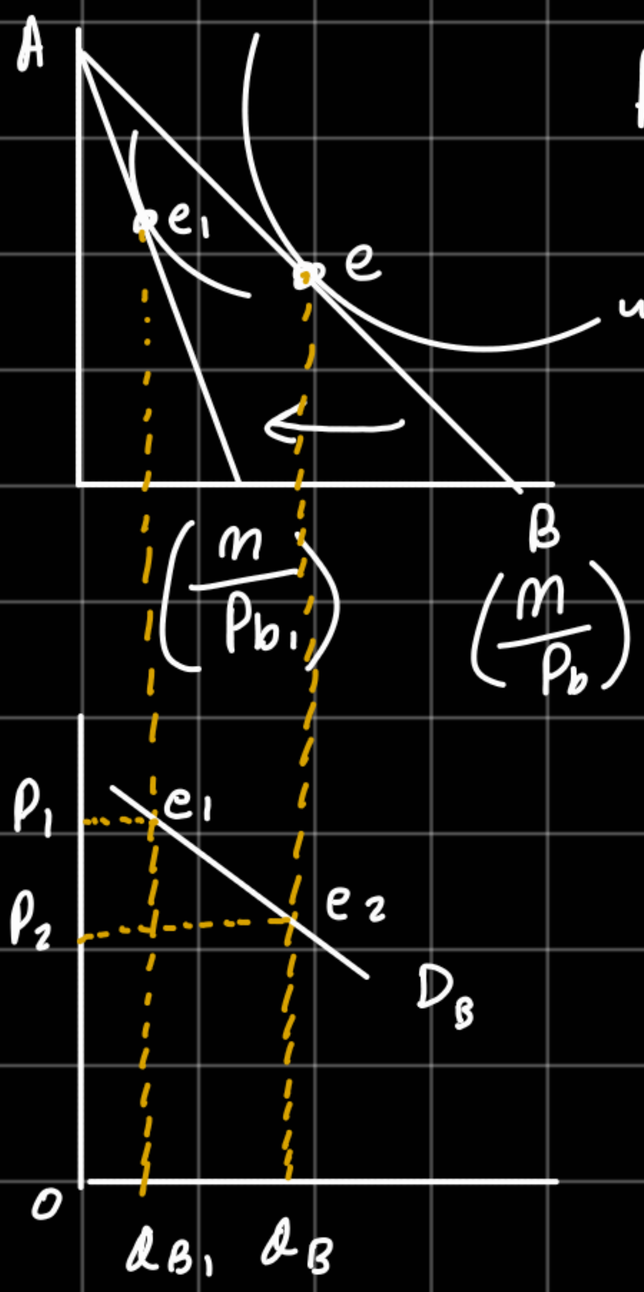




Normal good vs giffen good

$P \propto \frac{1}{Q_d}$

$P \propto Q_d$



$P_b \uparrow$ normal Good

$\frac{M}{P}$ = Real income

Real income = income − inflation $P \propto Q_D$

2/10/24

normal good

1) follows law of demand

$$P \propto \frac{1}{Q_d}$$

eg: Goods of daily use
- Competitor's pricing
- Psychological pricing
- Cost plus pricing

Giffen good

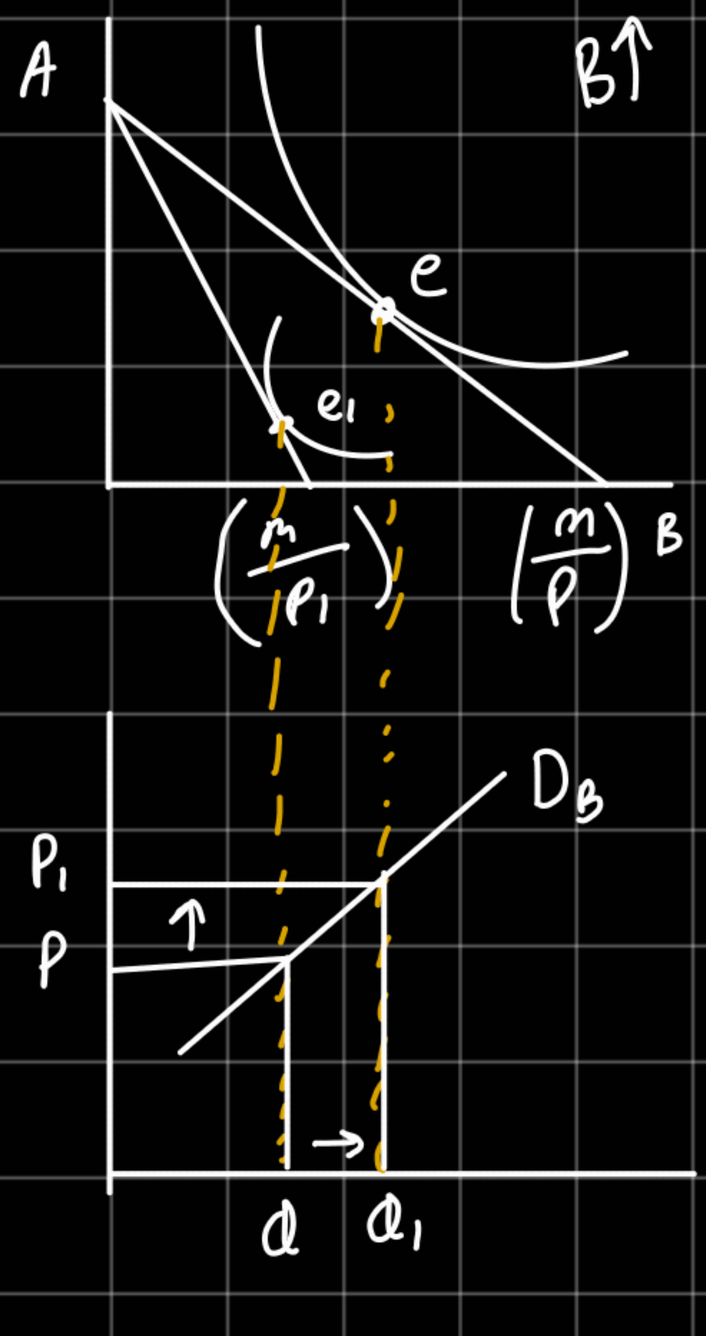
it violates the law of demand

$$P \propto Q_d$$

- It has to be of inferior quality
- most inferior quality good is giffen good

eg inferior quality price : cyclostyle paper

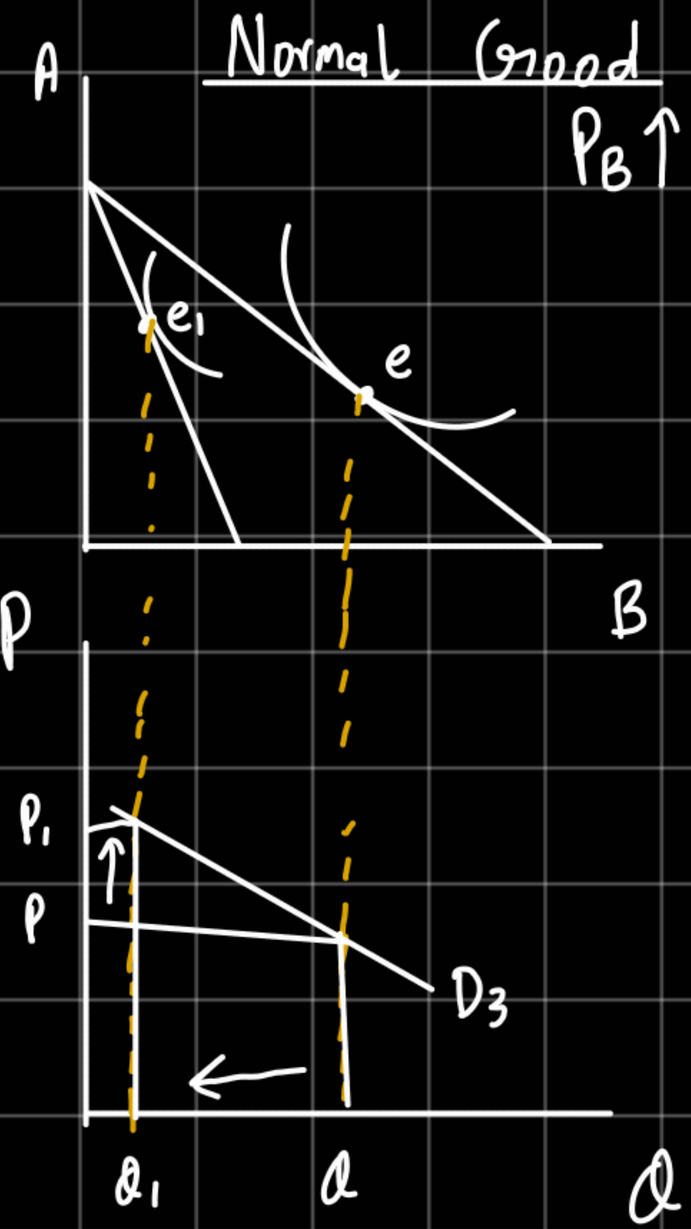
Giffen good demand curve



Good B is a giffen good and it's price increases

$\left(\frac{m}{p}\right)$ is the real income

with price increase the quality of giffen good has improved.



Cost of production

1) explicit cost
2) implicit cost
3) accounting profit
4) economic profit
5) $TC = FC + VC$
6) Law of diminishing returns
   - short run
   - long run

Explicit cost

is visible cost, sometimes refered as direct cost

Implicit cost

hidden cost, sometimes not quantified by accounts.
may also be the opportunity cost of doing things

Accounting profit

$Tr = P \times Q$ $\quad Tc = \underset{\text{cost}}{\text{exp}} + \underset{\text{cost}}{\text{imp}}$

$\text{Profit} = Tr - Tc$

$\text{acc profit} = Tr - \text{explicit cost}$

Economic profit

$= Tr - (\text{exp} + \text{imp})\ \text{cost}$

$\text{acc profit} > \text{eco profit}$

fixed cost

cost which does not change with output

- equipment
- infrastructure

Variable cost

it may change with output

Q2) helper = \$12k /yr
rent = \$5k /yr
material = \$20k /yr
investment = \$40k in equip → \$4k /yr earns

afforded = \$15k/yr
cst talent = \$3k /yr
revenue = \$72k/yr
acc prof = ?
eco prof = ?

actual

explicit = 12k + 5k + 20k = 37k

acc prof = 72k − 37k = 35k

implicit = 4k + 15k + 3k = 22k

tc (ex + im) = 37k + 22k = 59k

eco prof = 72k − 59k = 13k

→ actual + think input he puts

Law of diminishing returns

- Assumptions
- Short run
- labour is variable
- Technology is fixed

Statement

"as successive units of variable resource are added to fixed resource total product may increase to certain point but marginal product will decline"

Variable resources	total product	marginal product	avg product
0	0		
1	10	10	
2	25	15	
3	45	20	
4	60	15	
5	70	10	
6	75	5	
7	75	0	
8	70	5	

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

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

$$= TR - (Exp + Imp)\ cost$$

4 Oct 24

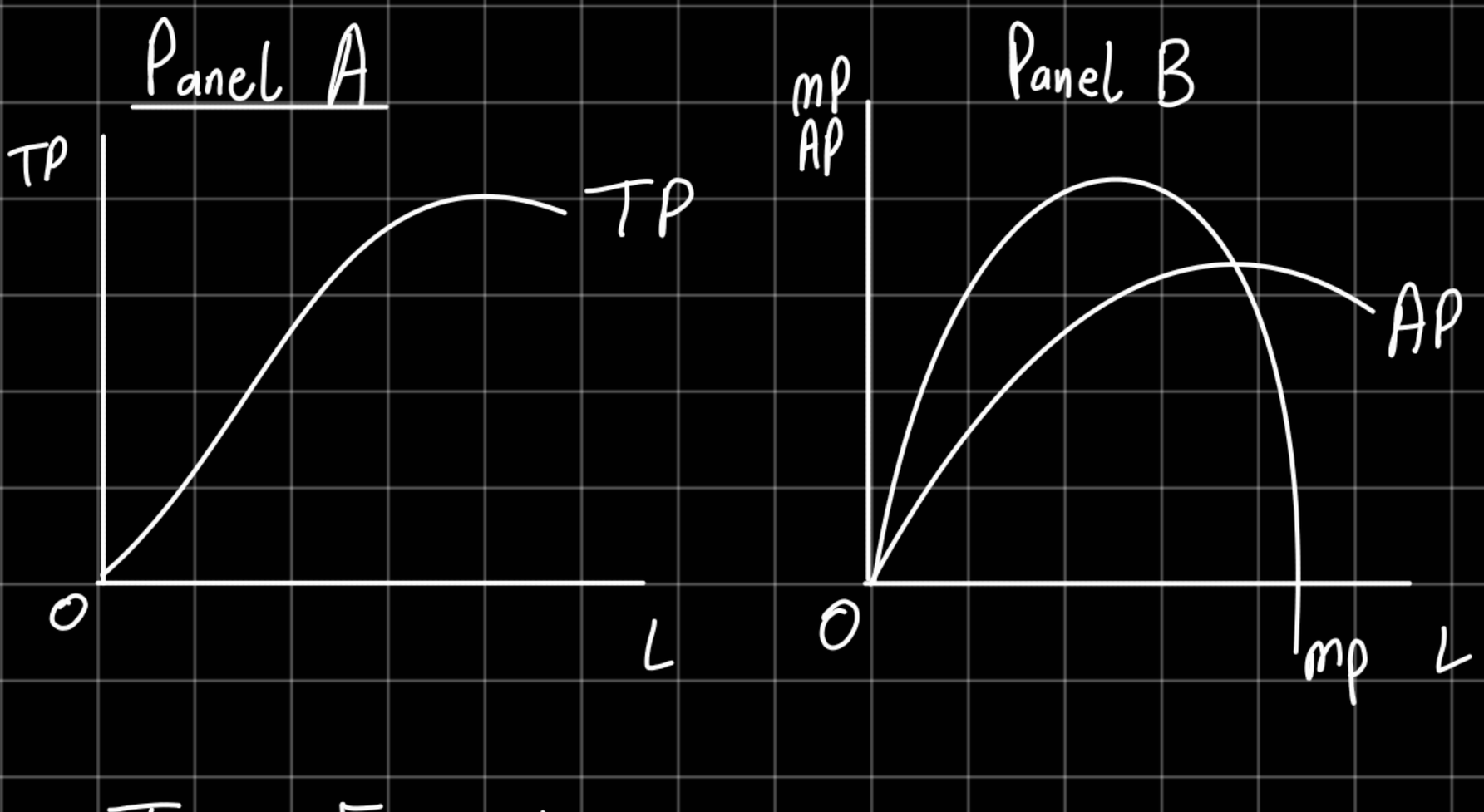
Cost of production

Total product = Total Output

units of variable resources	total product	Marginal product	Avg product
0	0		
		10	
1	10		10
		15	
2	25		12.5
		20	
3	45		15
		15	
4	60		15
		10	
5	70		14
		5	
6	75		12.5
		0	
7	75		10.75
		-5	
8	70		8.75

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

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



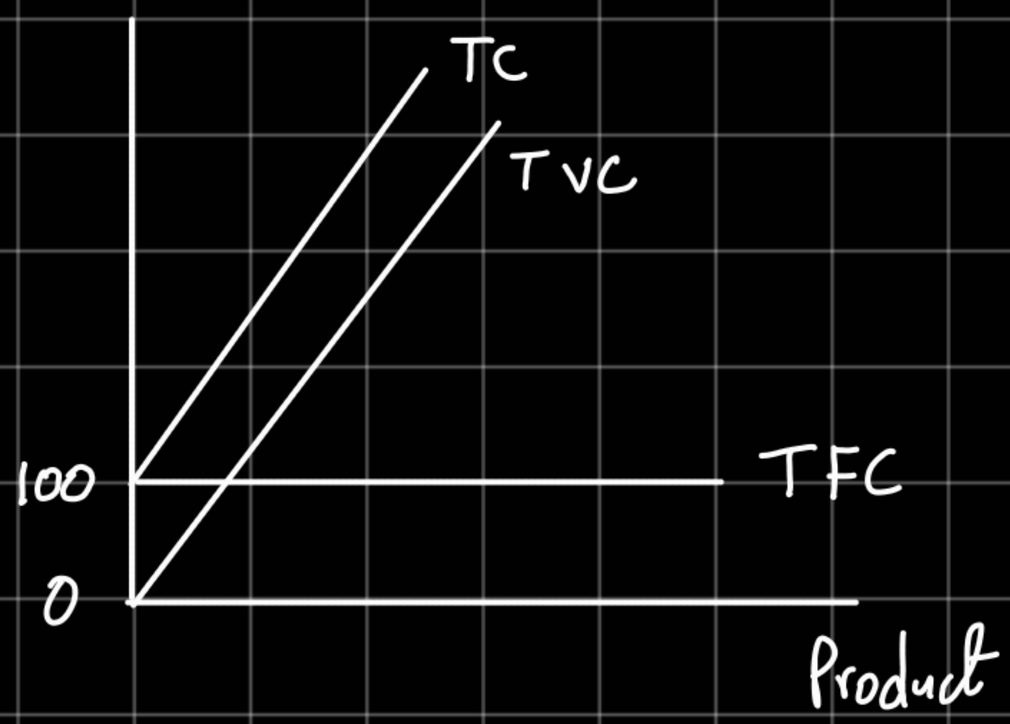
$TC = FC + VC$

Fixed cost

it does not change with output / product

Variable cost can change with output

e.g - fuel
- utility bills
- cost of variable resources



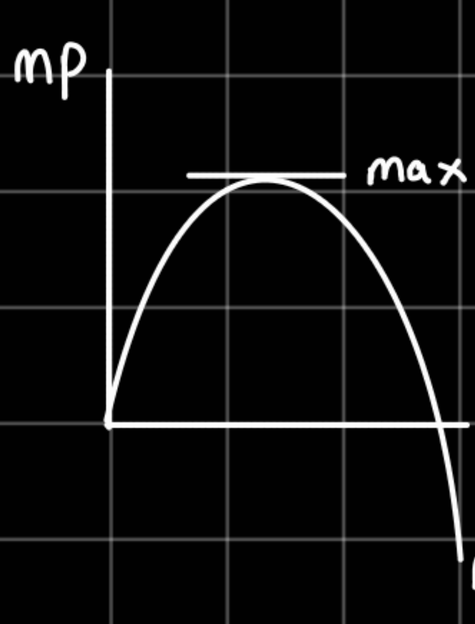
TC = 100 + 0

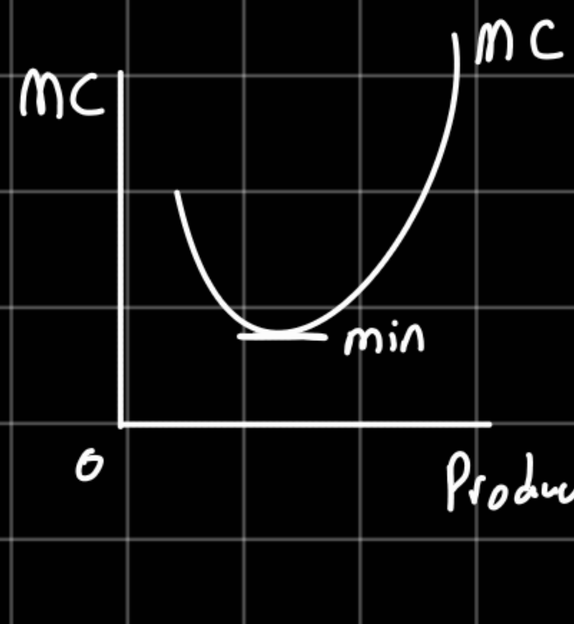
Marginal cost
$= \frac{\Delta TC}{\Delta TP}$

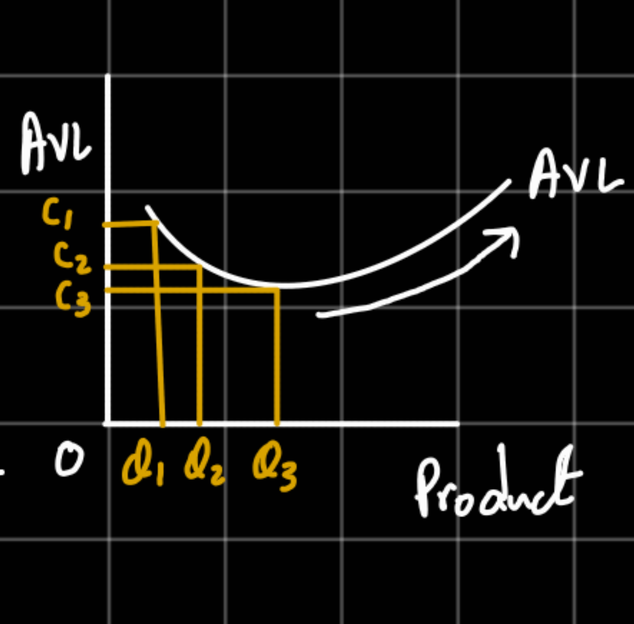
Avg cost
$= \frac{TC}{TP}$

$AVC = \frac{TVC}{Product}$ → avg variable cost; TVC → total variable cost

$AFC = \frac{TFC}{Product}$ → avg fixed cost; TFC → total fixed cost







TFC/TP ↑ TVC/TP ↑ TC/TP ↑ ΔTC/ΔT ↑

Total Product	Total Fixed Cost	Total Variable Cost	Total Cost	Average Fixed Cost	Average Variable Cost	Average Total Cost	Marginal Cost
0	$ 100	$ 0	$ 100	$ 0	$ 0	$	$ 45
1	100	45	145	100	45		40
2	100	85	185	50	42		35
3	100	120	220	33.33	40		
4	100	150	250	25	37.5		
5	100	185	285	20	37		
6	100	225	325	16.67	37.5		
7	100	270	370	14.3	38.5		
8	100	325	425	12.5	40.63		
9	100	390	490	11.11	43.33		
10	100	465	565	10	46.5		

8. Indicate how each of the following would shift the (1) mar-

10. *Key Question* Use the concepts of economies and diseconomies of scale to explain the shape of a firm's long-run

Q.1) Why marginal product curve is mirror image of marginal cost curve?

Q.2) Why avg variable cost curve is U-shaped?

Ans1 Bcs of law of diminishing return

Ans2