Date:

Elasticity Of Demand:

→ **Elasticity :**

It's percentage change in quantity demanded due to the percentage change in price.

$$E_D = \frac{\% \Delta Q_D}{\% \Delta P}.$$

-(OR)-

It's the percentage change in the quantity demanded due to the variables affecting demand.

Therefore,

$$E_D = \% \Delta Q_D / \% \Delta \text{ in variable affecting demand}$$

∴ variable is generally "Price".

→ **Inelastic demand of good:**

- When quantity demanded of goods do not change much by price change.
  e.g. Vegetables, i.e. potatoes, onions, minerals, salt, wheat, etc.
- The consumption is not affected by price.
- Utility of inelastic goods are high.

→ **Elastic Demand of goods :**

- Choices are there, as we can substitute goods.
- Slight price change can affect quantity demanded.
  $\Delta Q_D > \Delta P$.
- Consumption is not rigid.

Date:

* Baking, schools, educational institutes are inelastic.
* For entertainment, mobile & TV are elastic goods.

→ Factors Affecting Elasticity:
1. Price.
2. Income.
3. Substitute/complements.
4. Used goods.
5. Culture.
6. Habits.
7. Utility.
8. Real income ⇒ (money earned = constant; price = changes)

① Price Factor: (Also consider types of goods)
- Normal goods.
- Inferior goods.
- Luxury / Superior goods.

- Normal Goods:
  1. Price $\propto$ 1/Quantity demanded.
  2. Real income $\propto$ Quantity demanded.
  3. Real income $\propto$ 1/Price.
     RI↑ P↓.

- Inferior Goods: (quality < normal goods quality).
  1. Price $\propto$ quaulity demanded
  2. Real income $\propto$ 1/quantity demanded.
  3. Real income $\propto$ 1/price.

Date:

•– Luxury Goods : (similar to normal goods)

② Income :

•– positive effect.

•– with increase in income you can reach to elastic

as choices ↑.

③ Substitutes / Compliments :

•– Cross elasticity

$$\mathcal{E}_{cross} = \frac{\% \Delta Q_{DA}}{\% \Delta Q_{DB}}$$

∴ A and B are goods

④ Used Goods

•– cheaper to buy

•– Used good market ↑ → new good market ↓

•– If income is high then new " " ↑

⑤ Culture :

eg: Rings in christians & muslim weddings

•– Demand changes with different cultures.

⑥ Habits :

e.g Jogging → track suit & shoes required

fast food lovers → eating fast food required.

⑦ Utility :

What is important to yo

→ e.g specs of a product in demand ?

Date:

Handout # 04 :

Q2 **point elasticity :**

% change at one point of the demand curve

$\varepsilon_{pt} = \text{slope} \times P/Q \Rightarrow \text{slope} = \Delta Q / \Delta P$.

(a) $Q = 20 - 2P$.

slope = -2 (derivative of above equation)

for $P = 5$

$Q = 20 - 2(5)$

$Q = 10$

$\varepsilon_{pt} = -2 \times 5/10$

$\boxed{\varepsilon_{pt} = -1}$

unitary elastic

for $P = 9$

$Q = 20 - 2(9)$

$Q = 2$

$\varepsilon_{pt} = -2 \times 9/2$

$\boxed{\varepsilon_{pt} = -9} \rightarrow \boxed{\varepsilon_{pt} = 9}$ -ve doesn't matter.

elastic demand b/c $\% \Delta Q > \% \Delta P$.

$\Rightarrow$ price $\propto 1/Q_D$

If $\% \Delta Q > \% \Delta P$ → demand will be elastic.

(b) **Arc Elasticity :**

$$\varepsilon_{arc} = \left(\frac{Q_2 - Q_1}{(Q_1 + Q_2)/2}\right) \div \left(\frac{P_2 - P_1}{(P_2 + P_1)/2}\right)$$ → midpoint of prices.

$\boxed{P_1 = 5}$

$Q_1 = 20 - 2P_1$

$= 20 - 2(5)$

$\boxed{Q_1 = 10}$

$\boxed{P_2 = 6}$

$Q_2 = 20 - 2(6)$

$\boxed{Q_2 = 8}$

$\varepsilon_{arc} = \frac{-2}{18} \times \frac{11}{1}$

$\varepsilon_{arc} = -11/9$

$\boxed{\varepsilon_{arc} = -1.22}$

(c) $\varepsilon_{pt} = 1$ b/c $\% \Delta Q = \% \Delta P$

(see pg # 48)

Q4 ⑤

Date:

$Q = 30 - 2P$

(a) $P = 7$, $\varepsilon_{pt} = ?$

Slope $= -2$.

$Q = 30 - 2(7) = 16$.

$\varepsilon_{pt} = -2 \times 7/16 = -7/8 = -0.875$

(b) $P_1 = 5$, $P_2 = 6$, $\varepsilon_{arc} = ?$

$Q_1 = 20$, $Q_2 = 18$.

$\varepsilon_{arc} = \frac{-2}{16} \div \frac{1}{11/2}$

$= \frac{-2}{19} \times \frac{11}{2}$

$\boxed{\varepsilon_{arc} = -11/19}$

(c) ε_{pt} and ε_{arc} will not change until demand curve changes.

Q6

$Q_1 = 3000$, monthly $= \$25$

Similar sell $= \$28$.

(a) $\varepsilon = -3$

price lowered $= \$22$.

AM/FM radio clock

$P_1 = 25$, $P_2 = 22$, $Q_1 = 3000$, $Q_2 = ?$

$\varepsilon_{arc} = -3$

$-3 = \frac{Q_2 - 3000}{(3000 + Q_2)/2} \div \frac{-3}{47/2}$

$\frac{-3 \times -3}{47} = \left(\frac{Q_2 - 3000}{3000 + Q_2}\right)$

$9(3000 + Q_2) = 47(Q_2 - 3000)$

$38 Q_2 = 168000$.

$\boxed{Q_2 = 4421.05}$

(b) A = ABC company, B = competitors

$\varepsilon_{cross} = \frac{\% \Delta Q_{DA}}{\% \Delta P_B}$

$\Delta Y \propto Q_D \uparrow$
$\Delta P \propto 1/Q_D \downarrow$

Date:

Q3

$Q = 100 - 10p + 0.5Y$

$p = 7,\ Y = 50$

(a) $Q = 100 - 10(7) + 0.5(50)$

$\boxed{Q = 55}$

(b) $E_{pt} = ?$

$\mathcal{E}_{pt} = -10 \times \frac{7}{55}$

$\boxed{\mathcal{E}_{pt} = -14/11}$

(c) point income elasticity

$\mathcal{E}_{pt} = \frac{\Delta Q}{\Delta Y} \times \frac{Y}{Q}$

$= 0.5 \times \frac{50}{55}$

$\boxed{\mathcal{E}_{pt} = 5/11}$

(d) $Y = 70,\ p = 8,\ \mathcal{E}_{pt}$

$Q = 100 - 10(8) + 0.5(70)$

$= 55.$

$\mathcal{E}_{pt} = -10 \times \frac{8}{55}$

$\boxed{\mathcal{E}_{pt} = 16/11}$

Note :

$|\mathcal{E}_{pt}| > 1$ elastic

$|\mathcal{E}_{pt}| < 1$ inelastic

$|\mathcal{E}_{pt}| = 1$ unitary.

Q15 $Q = 2000 - 20P.$

(a) How many units sold at \$10 = ?

$Q = 2000 - 20(\$)$

$\boxed{Q = 1800 \text{ units}}$

(b) $Q = 2000,\ P = ?$

$2000 = 2000 - 20P.$

$20p = 0.$

$\boxed{p = \$0}.$

(c) Equation for total and marginal revenue = ?

$Q = 2000 - 20p.$

$TR = Q \times P.$

MR = change in TR.

$\therefore$

$Q = 2000 - 20p.$

$20p = 2000 - Q$

$P = (2000 - Q)/20$

$\boxed{P = 100 - 0.05Q}$

(x)ing Q on b.s.

Date:

$\boxed{Q \times P = 100Q - 0.05Q^2}$ —(A)

Total revenue in terms of Q

$\therefore \frac{d}{dQ}(Q \times P) = \frac{d}{dQ}(100Q - 0.05Q^2)$

$\boxed{\frac{d}{dQ} PQ = 100 - 0.05(2)Q}$ —(i)

MR in terms of Q!

$\therefore Q = 2000 - 20P$.

$\boxed{PQ = 2000P - 20P^2}$ —(B)

TR in terms of P!

and

$\boxed{\frac{d}{dP} QP = 2000 - 20(2)P}$ —(ii)

MR in terms of P

(d) $P = \$70$ TR = ? MR = ?

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

$\boxed{TR = 42000}$

$MR = 2000 - 20(2)(70)$

$\boxed{MR = -800}$

(e) Use point elasticity

$\varepsilon_{pt} = \text{slope} \times \frac{P}{Q}$

slope $= -20$.

$Q = +2000 - 20(70) = 600$

$\varepsilon_{pt} = -20 \times \frac{70}{600}$

$\varepsilon_{pt} = -7/3$

$\boxed{\varepsilon_{pt} = -2.33}$

(f) $P = \$60$, TR = ?, MR = ?, $\varepsilon_{pt} = ?$

$TR = 60(2000) - 20(60)^2$

$\boxed{TR = 48000}$

and

$MR = 2000 - 20(2)(60)$

$\boxed{MR = -400}$

$Q = 2000 - 20(60) = 800$

slope $= -20$.

$\varepsilon_{pt} = -20 \times 60/800$

$\boxed{\varepsilon_{pt} = -1.5}$

Date:

g) Negative slope and unitary elastic

$\varepsilon_{pt} = \text{slope} \times P/Q$

$-1 = -20 \times \frac{P}{2000-20p}$

$\frac{20p - 2000}{-20} = P$

$40P = 2000$

$\boxed{P = \$50}$

Q14 :

$\varepsilon_{arc} = ?$, $\varepsilon_{cross} = ?$

$\varepsilon_{pt} = ?$ $\varepsilon_{y} = ?$

(a) from month 1—2, cross elasticity will be applied

- price, income → same
- Q = changes 200 → 210.
- P_{good} = " 130 → 135

(b) Month 2—3, income elasticity

- price, P_{good} = same
- Income↑ , Q changes.

so,

Income elasticity formula

$$\left(\frac{Q_2 - Q_1}{\frac{(Q_2+Q_1)}{2}}\right) \div \left(\frac{Y_2 - Y_1}{\frac{(Y_2+Y_1)}{2}}\right)$$

$y_1 \to$ month 2 = 4000.

y_2 = M3 = 4200

$Q_1 = 210$

$Q_2 = 220$

$\frac{10}{430} \times \frac{8200}{200} = \frac{410}{430}$

$\boxed{\varepsilon_{income} = 0.95}$

(c) M3—4, ε_{arc}.

M3 ⇒ $P_1 = 120$, $Q_1 = 220$

M4 ⇒ $P_2 = 110$, $Q_2 = 240$

∴

$$\varepsilon_{arc} = \left(\frac{Q_2 - Q_1}{\frac{(Q_1+Q_2)}{2}}\right) \div \left(\frac{P_2 - P_1}{\frac{(P_2+P_1)}{2}}\right)$$

(d) M4—5, arc elasticity.

M4 ⇒ $P_1 = 110$ $Q_1 = 240$

M5 ⇒ $P_2 = 114$ $Q_2 = 230$

(e) M5—6, arc and ε_{cross} are applied.

→ we use ε_{cross} coz P changes

9

decline in P affects so much on Q.

by 1 due to which P_{good} ↓ by 20 and change in Q ↓

so we can say,

decline in demand curve is due to price ↓

$Q_1 = 230$, $P_1 = 145$

$Q_2 = 215$, $P_2 = 125$.

(f) In month 6,7 we apply income elasticity.

——— x ——— x ———

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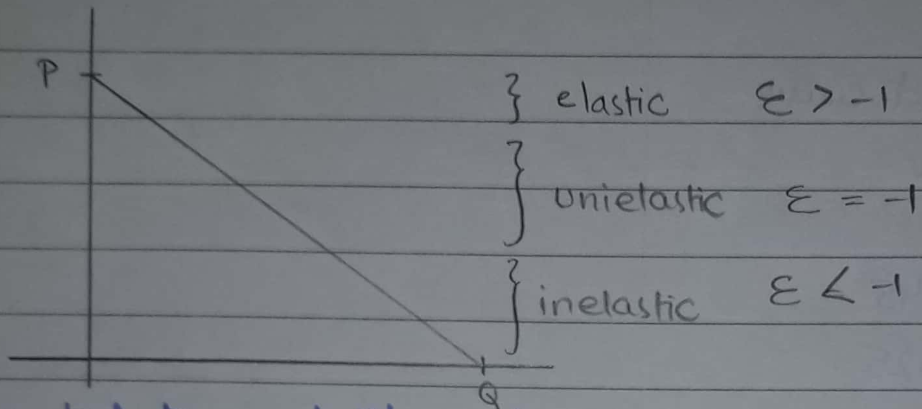
Total revenue & Demand elasticity !

Date:

Total revenue = Q × P.



Movie tickets and it's sales :

$TR_1 = 8 \times 1 = 8000$

$TR_2 = 7 \times 2 = 14000$

$TR_3 = 6 \times 3 = 18000$

$TR_4 = 5 \times 4 = 20000$

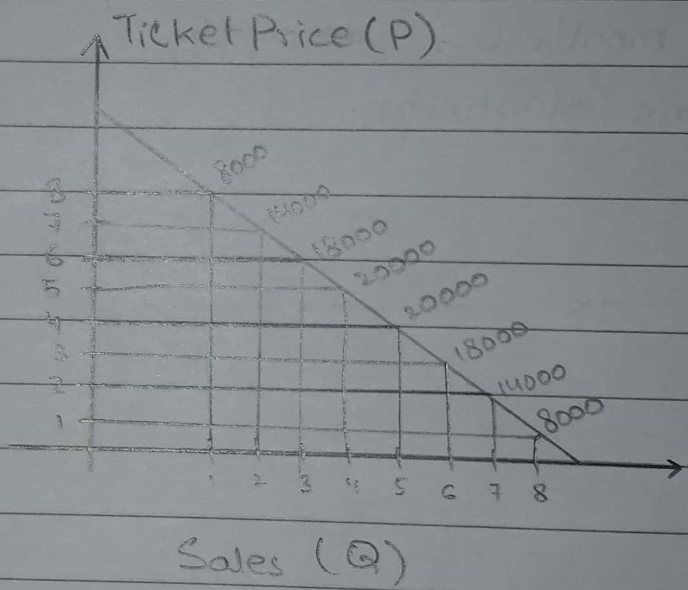
$TR_5 = 4 \times 5 = 20000$

$TR_6 = 3 \times 6 = 18000$

$TR_7 = 2 \times 7 = 14000$

$TR_8 = 1 \times 8 = 8000$

P Q



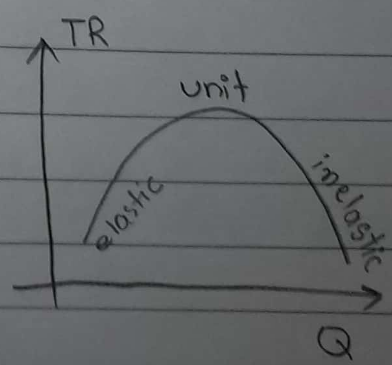
In unit elastic region :

TR and demand elasticity both are same (constant)

TR ↑ ⇒ ε > -1 elastic

TR constant ⇒ ε = -1 unit elastic

TR ↓ ⇒ ε < -1 inelastic



Date:

Q2

(c) ε_{pt} should be -1 — b/c of unit elastic region of demand curve.

$Q = 20 - 2P$

$\therefore$

$\varepsilon_{pt} = \text{slope} \times \frac{P}{Q}$

$-1 = -2 \times \frac{P}{20-2P}$

$4p = 20$

$\boxed{P = \$5}$

Q5

$P_1 = \$70$, $Q_1 = Q_{old} = 4000$

$P_2 = P_{new} = \$63$, $\varepsilon_{arc} = -2.5$

$Q_2 = Q_{old} = ?$

ε_{arc}

$\Rightarrow -2.5 = \frac{Q_2 - Q_1}{Q_2 + Q_1} \times \frac{P_2 + P_1}{P_2 - P_1}$

$-2.5 = \frac{Q_2 - 4000}{Q_2 + 4000} \times \frac{63-70}{63+70}$

$\frac{-2.5 \times (-2)}{19} = \frac{2Q_2 - 8000}{Q_2 + 4000}$

$38Q_2 - 5Q_2 = 20000 + 152000$

$33Q_2 = 172000$

$\boxed{Q_2 = 5212.1212}$

TR↑ because $\varepsilon > -1$

Q12 $\varepsilon_{cross} = ?$

Q13 (a) $\varepsilon_{cross} = ?$ (b) ? (c) ?

Q16 (a) ? (b) ? (c) factors other than price that affect elasticity.

19/3/19

Utility Analysis.

① Budget line approach. → objective approach.

② Indifference curve approach

① Budget line Approach:
(Budget constraint)

Budget constraint is a linear curve showing fixed income and individual can have various combinations of (t goods within fixed income

↳ also called 'Price line'

Equation:

$M = P_a \cdot A + P_B \cdot B$.

where,

M = income

P_a = Price of A

A = unit of A

P_B = Price of B

B = unit of B.

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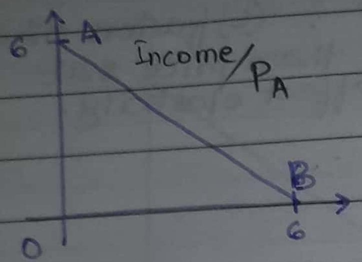
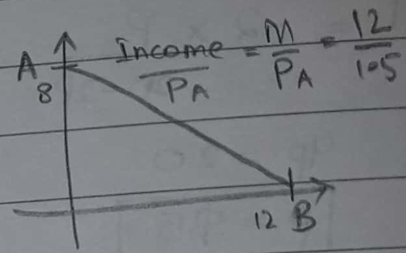
Limitation of budget line approach → only 2 goods → fixed income.



"Area under curve is attainable, beyond is not attainable."



Eg #

$M = 12\$$ $P_A = 1.50\$$ $P_B = 1\$$

for good A :

if A is not consumed then 12 unit of B can be consumed. → $(0, 12)$ $M/p = 12/1$

for good B :

if B is not consumed then 8 units of A can be consumed → $(8, 0)$

units of A	units of B	$M = P_A A + P_B B$.
8	0	$12 = 8 \times (1.5) + 0(1)$
6	3	$12 = 6(1.5) + 3$
4	6	$12 = 4(1.5) + 6$
2	9	$12 = 2(1.5) + 9$
0	12	$12 = 0(1.5) + 12$

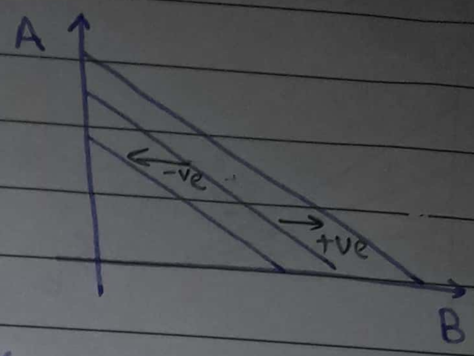
$$\text{slope} = \frac{P_B}{P_A} = \frac{1}{1.5} = \frac{2}{3} \Rightarrow \boxed{\frac{P_B}{P_A} = \frac{2}{3}} \Rightarrow \boxed{3P_B = 2P_A}$$

→ Q: What would be the budget constraint if there is price or income change = ?

→ Shift and movement in budget constraints.

Date:

① If income improves budget constraints will shift rightwards.



② If income decreases budget constraints will shift leftwards.

e.g If income is double.

M = 12$ => M = 24 $

P_A = 1.50$, P_B = 1 $

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

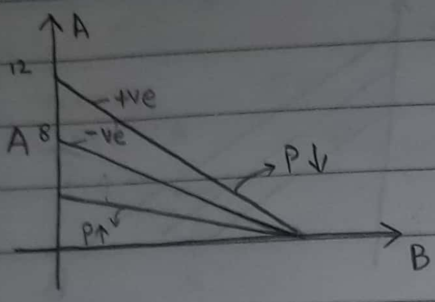
3) If price increases, budget line rotates inward (horizontal axis) -ve.

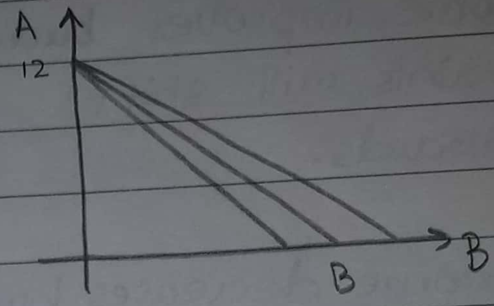
1) If price decreases, budget line rotates outward (vertical axis) +ve.

Date:

Price
outward rotation → decline.
inward rotation → increase.

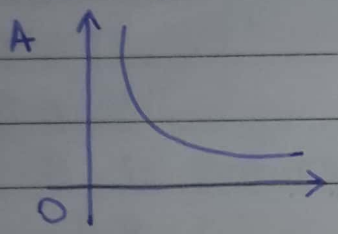
e.g. $P_A = 1.5 \downarrow$ to $P_A = 1$





② Indifference Curve Approach.

Indifference is locus of point indicating various combinations of two goods in a subjective manner.



Properties :
① Convex to origin and -vely sloped.
② Indifference map of curves
③ Consumer equilibrium on indifference curve.

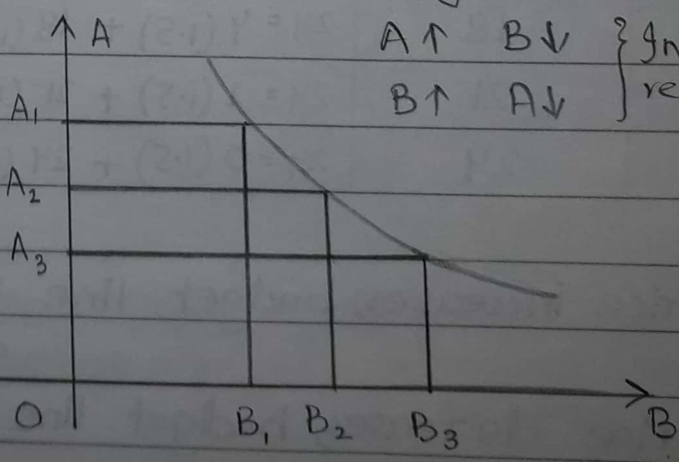
Q: Why convex? → (because of perfect application)

A: Convex shape explains the application of law of diminishing marginal utility and marginal rate of substitution.

Rate of substitution giving A to gain B

A↑ B↓ } Inverse
B↑ A↓ } relation

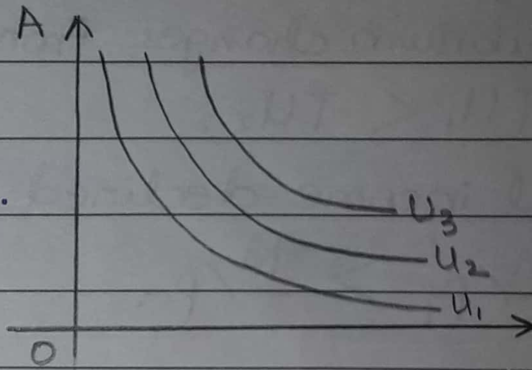
Law of diminishing MU.
At $(A_1, 0)$
$TU_A \downarrow \rightarrow MU_A \uparrow$
$TU_B \uparrow \rightarrow MU_B \downarrow$



MU of substitution

Unit of A↓ ⟶ Unit of B↑

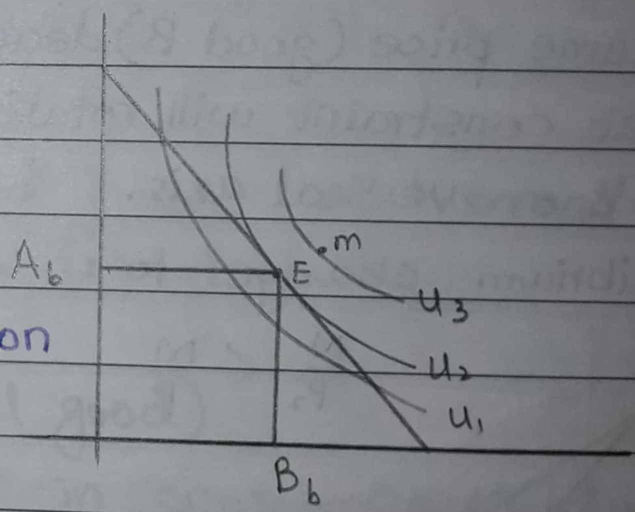
Q: Indifference map of the curve = ?



- U_1 is closer to origin, has min TU.
- U_3 alway from origin, has max TU.
- It explains utility level:

  $TU_3 > TU_2 > TU_1$

Q: Consumer equilibrium = ?



Optimum point at E because slope of budget constraint = Marginal rate of substitution

Refers to the tangency and equilibrium of the consumer. $MRS = P_A / P_B$

Consumer's Equilibrium and deriving demand curve.

Normal goods:

- Quantity demanded ∝ 1/ price.
- " " ∝ 1/ real income.

Real income = income earned / price of good.

Real income = income earned − inflation.

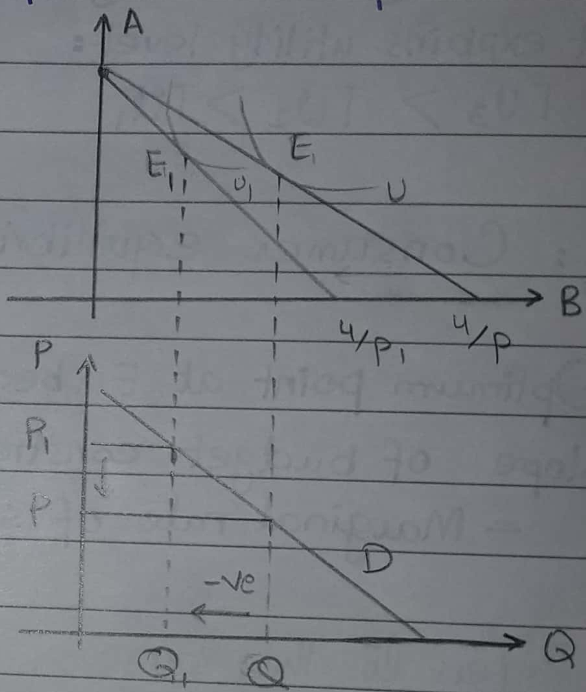
Date:

★ Utility At the indifference curve :

Case 1 :

Assume price (good B) increases

- Budget constraint will rotate inwards on horizontal axis.
- Equilibrium changes from E_1 and now individual is on U_1, $TU_1 < TU_2$.
- Real income declined because of increase in price. $M/P_1 > M/P$.



price effect is -ve

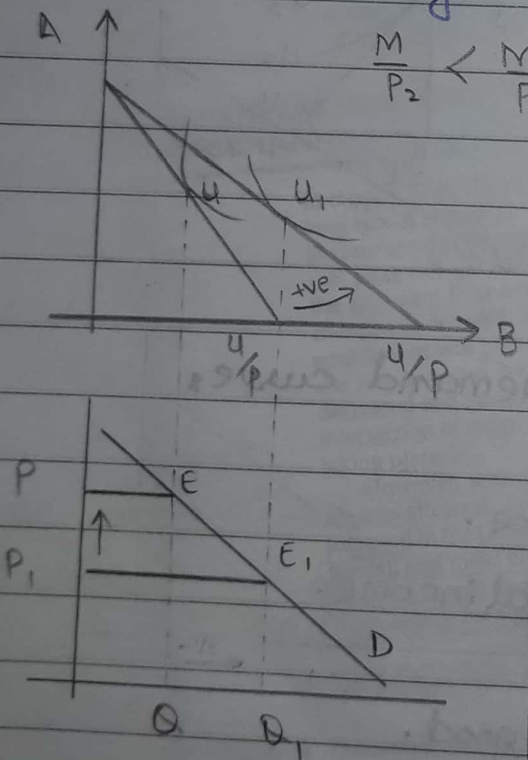
Case 2 :

predeclines

Assume price (good B) decreases

- Budget constraint will rotate outwards on vertical axis.
- Equilibrium changes to :

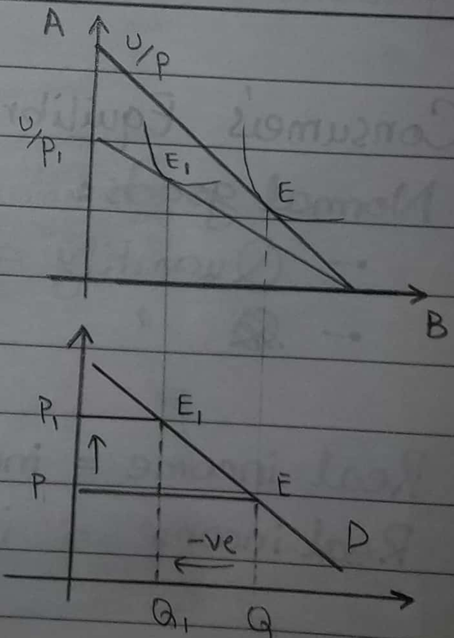
$\frac{M}{P_2} < \frac{M}{P}$



U at U_1 > TU at U

Case 3 :

Assume ~~of~~ price (good A) increases.



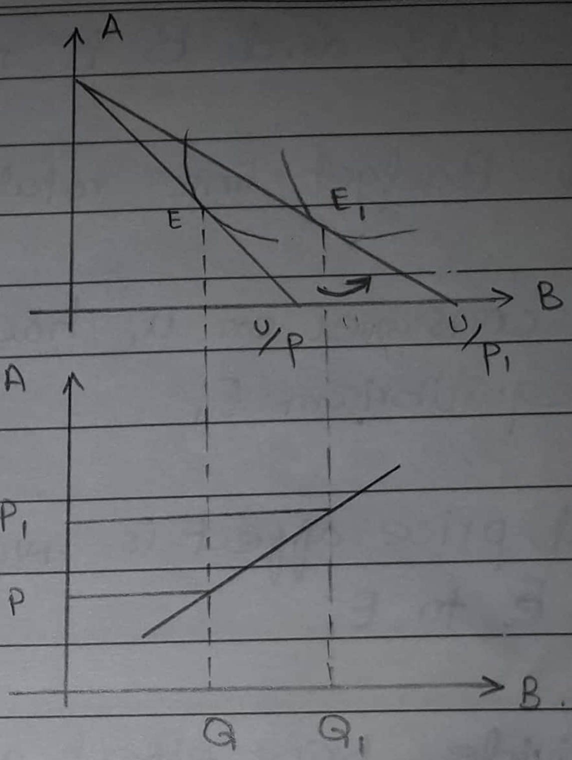
price increases
Quality decreases.

Eisha!

Date:

Case 4 :

Assume that good B is a giffing good . It's price increases. →



Price ↑ , Demand ↑

26th March, 19

Substitution and income affect (case of normal good)

* Approach : Indifference curve and budget line .

.- Substitution effect : (Normal good)

It's change in consumption due to place change or the quantity substituted is either increased or decreased

.- Income effect (Normal good)

It's change in real income due to the price change .

$P\uparrow \rightarrow M/P\downarrow$

$P\downarrow \rightarrow M/P\uparrow$

$\{ \because M/P = \text{real income} \}$

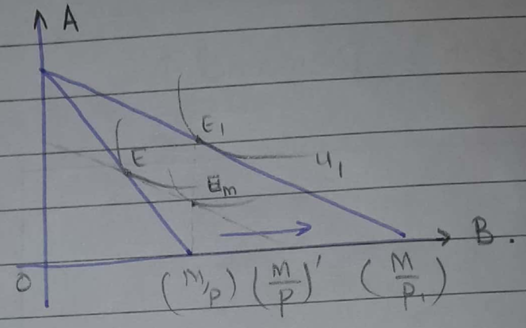
.- Price effect : substitution + Income effect .

Date:

Case 1 :

$P_B \downarrow$ and B is normal good.

① $P_B \downarrow$ Budget line rotates outward and real income $\uparrow$



② The consumer on u_1 has new equilibrium E_1

③ Total price affect is +ve from E to E_1

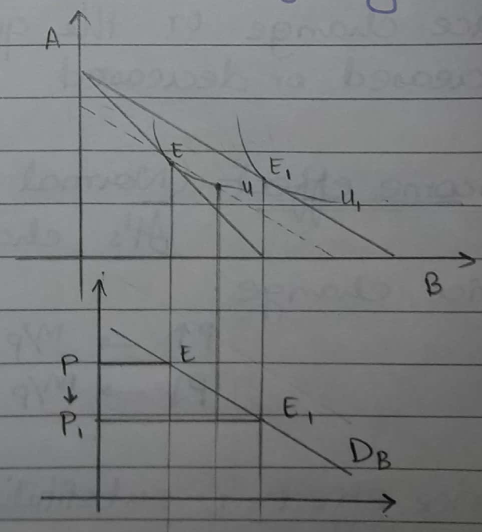
④ To divide price effect a fictious budget line is introduces that should be parallel to new budget line.

⑤ Fictious budget line bring back consumer to original indifference curve.

⑥ E_m is imaginary equilibrium $(M/P)'$ is imaginary real income.

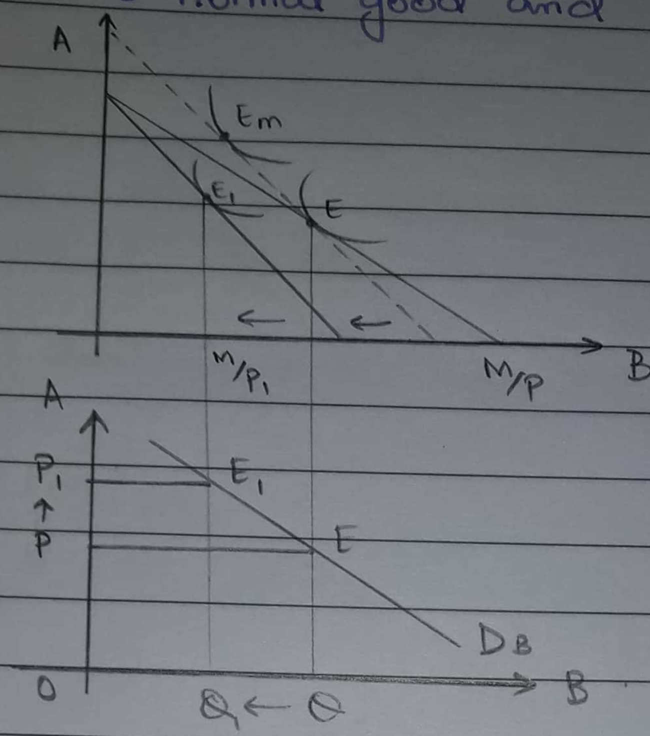
⑦ $E \longrightarrow E_m$ (subs. +ve)

$E_m \longrightarrow E_1$ (income +ve)



Date:

Case 2 B is normal good and $P_B \uparrow$



$(M/P_1) < (M/P)$

$E - E_m$ = −ve subs.

$E_m - E$ = −ve income

$P_1 > P$.

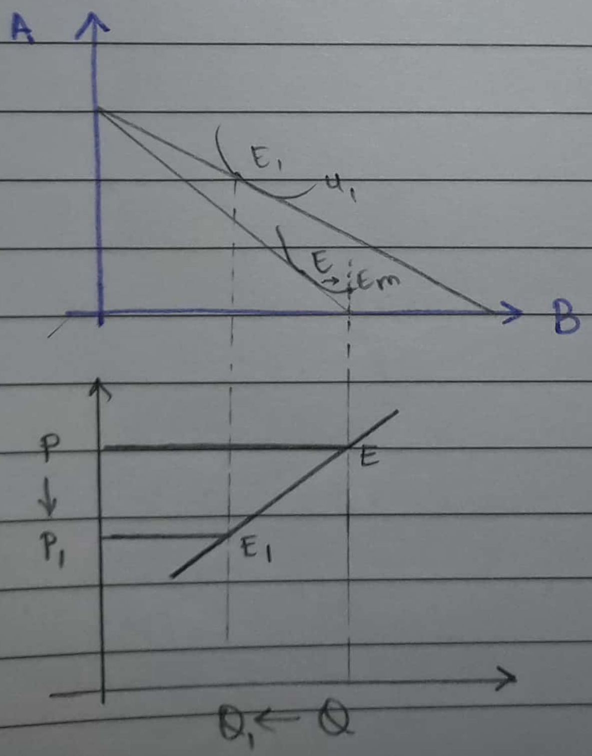
Case : Demand curve for giffin good.

$P_B \downarrow$

In giffin good : $P \propto Q$.

$E \rightarrow E_m$: +ve Subs.

$E_m \rightarrow E_1$: −ve ~~Subs~~ incom



Income effect offsets substitution effect.

The End!