Week-5

L1 The Consumer's Problem

- Consump^n set $X \rightarrow n$ goods $X = R_n^+$ $(x_i \ldots x_n)$ $x_i \geq 0$
- Feasible set $\rightarrow$ budget set
- preferences $\rightarrow$ utility func^n
- behavioural assump^n -

$x^* \in (B(x))$ s.t. $B(x) \in$ budget set

$x^* \succsim x$

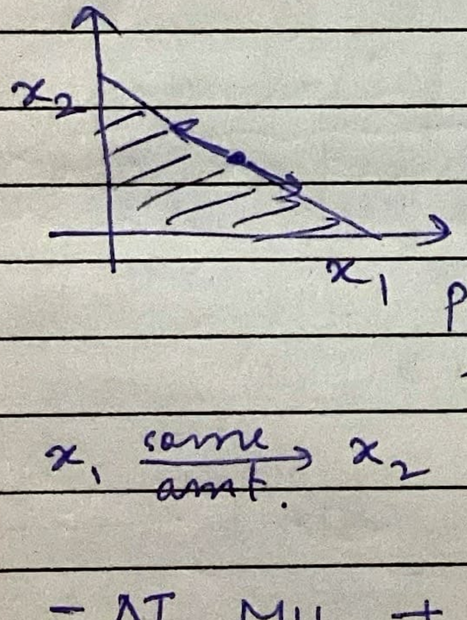
$B(x) = \{x \mid x \in X \text{ and } Px \leq I\}$

$P_1x_1 + \ldots P_nx_n = I$

$\max(U(x))$ s.t. $Px \leq I$

- utility maximiza^n

$\max\limits_{x} U(x_1, x_2)$ s.t. $P_1x_1 + P_2x_2 \leq I$



Let's (x_1^*, x_2^*) maximises $U(x_1, x_2)$

$P_1x_1^* + P_2x_2^* = I$

$I_1 + I_2 = I$

$x_1 \xrightarrow[\text{amt.}]{\text{same}} x_2$ $MU_1 = \dfrac{\partial U}{\partial x_1}$

$-\dfrac{\Delta I}{P_1} MU_1 + \dfrac{\Delta I}{P_2} MU_2 \leq 0$

if this is not the case, then your (x_1^*, x_2^*) were not optimum

→ MRS → marginal rate of substitution

$$-\frac{MU_1}{MU_2} = -\frac{P_1}{P_2} \rightarrow \text{slope of the budget line}$$

- Arbitrage argument

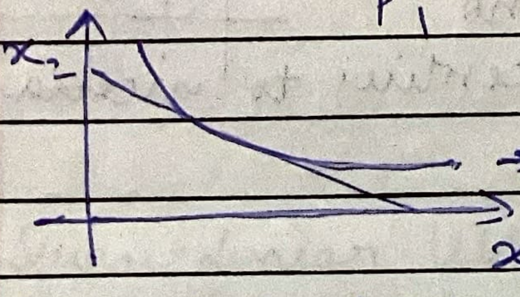
$$100 = P_1 x_1^* + P_2 x_2^*$$

↑ Rs.

if, $\frac{MU_1}{P_1} > \frac{MU_2}{P_2} \Rightarrow$ spend on good 1

if, $\frac{MU_1}{P_1} < \frac{MU_2}{P_2} \Rightarrow$ spend on good 2

else, $\frac{MU_1}{P_1} = \frac{MU_2}{P_2} \Rightarrow$ indifferent



→ indiff. curve

- Marginal utility of income

$$\frac{MU_1}{P_1} = \frac{MU_2}{P_2} \rightarrow \text{Marginal utility of income}$$

- Corner solutions

$\frac{MU_1}{P_1} > \frac{MU_2}{P_2}$ or vice-versa

- Many goods → $(x_1^*, \ldots, x_n^*)$

(x_i^*, x_j^*)

$$\frac{MU_i}{P_i} = \frac{MU_j}{P_j} \quad \forall\, i, j$$

✓ ✓ ✓ × × × ×

Eg. 1, 2, 3, 4 .... n

$$\frac{MU_1}{P_1} = \frac{MU_2}{P_2} = \frac{MU_3}{P_3} \geq \frac{MU_4}{P_4} \ldots$$

$$\frac{MU_1}{P_1} = \frac{MU_2}{P_2} \cdots = \frac{MU_n}{P_n} = \lambda \rightarrow \text{marginal utility of income}$$

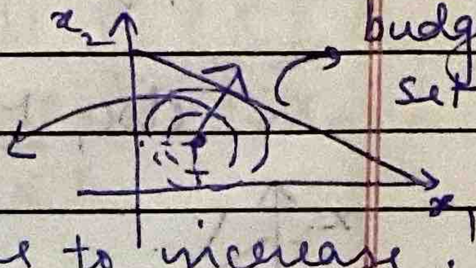
$$MU_n - \lambda P_n = 0 \quad \forall\, n \in (1, 2, \ldots n)$$

- Non-binding constraints

$$\max_{x} U(x_1, x_2) \qquad P_1 x_1 + P_2 x_2 < I$$

$$P_1 x_1 + P_2 x_2 + x_3 = I$$

$$\frac{MU_1}{P_1} = \frac{MU_2}{P_2} = \frac{MU_3}{P_3} = 0$$



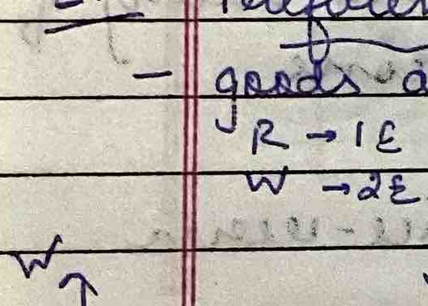
L2 <u>Preferences & Utility Func^ns</u>

- goods are perfect substitute

$R \rightarrow 1E$ $\quad U(R, W) = R + 2W \quad MRS = -\frac{MU_R}{MU_W} = \frac{-1}{2}$

$W \rightarrow 2E$

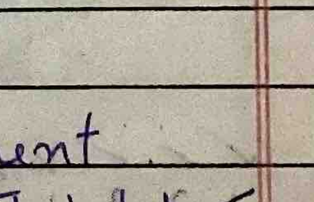
$$V(R, W) = \log(R + 2W) \quad MRS = -\frac{1}{2}$$



MRS is always const.

- goods are perfect compliment

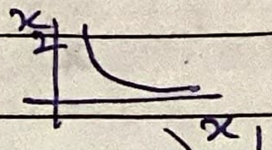
$$U(B, J) = \min\left\{\frac{B}{2}, J\right\}$$



$$v(B, J) = [U(B, J)]^2$$

- Cobb Douglas func^n

$U(x_1, x_2) = x_1^{\alpha} x_2^{\beta}$

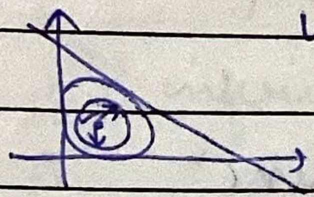


$V(x_1, x_2) = \log(U(x_1, x_2))$

$= \alpha \log x_1 + \beta \log x_2$

Eg. curd, jalebi → u are willing to give large amt. of curd to get some jalebi, so that you can eat it together.

- Bliss pt. → pt. where you have max. utility



→ (0,0)

$U(C,J) = -\left[(C-C_0)^2 + (J-J_0)^2\right]$

- Quasi-Linear Utility func^n

$U(x,y) = f(x) + y$

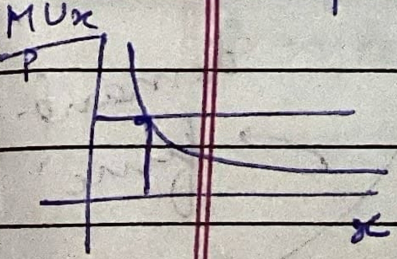
$f'(x) > 0$ & $f''(x) < 0$

→ $\log x$, $3x^{1/2}$

Eg. $x^{1/2} + y$ $\quad MRS = \frac{-MU_x}{MU_y} = \frac{-1}{2} x^{-1/2}$

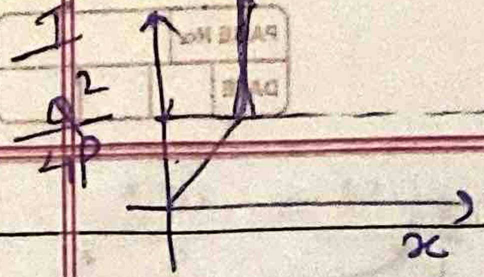
$Px + Qy \leq I$

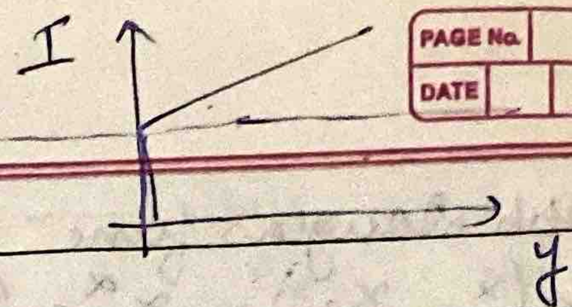
Slope $= \frac{-P}{Q} \Rightarrow x^* = \frac{Q^2}{4P^2}$, $y^* = \frac{I - Q^2/4P}{Q}$



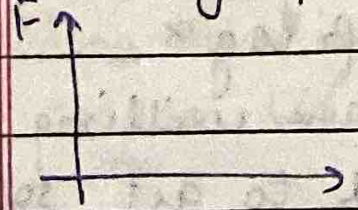
if $I < \frac{Q^2}{4P} \Rightarrow x^* = \frac{I}{P}$, $y = 0$

$I \geq \frac{Q^2}{4P} \Rightarrow x^* = \frac{Q^2}{4P^2}$, $y^* = \frac{I - Px^*}{Q}$





- Lexicographic preferences



freedom, chocolates

(C_1, F_1) , (C_2, F_2)

if $C_1 > C_2 \Rightarrow (C_1, F_1) \succ (C_2 F_2)$

$C_1 = C_2 \Rightarrow (C_1, F_1) \succ (C_2, F_2)$

iff. $F_1 > F_2$

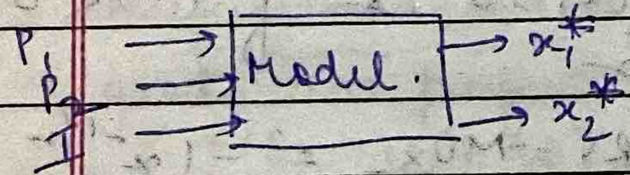
L3 Demand Func^n

- Marshallian demand func^n

$\max_{x_1, x_2} U(x_1, x_2)$ s.t. $P_1 x_1 + P_2 x_2 \leq I$

$x^*_{1/2} = x^*_{1/2}(P_1, P_2, I)$

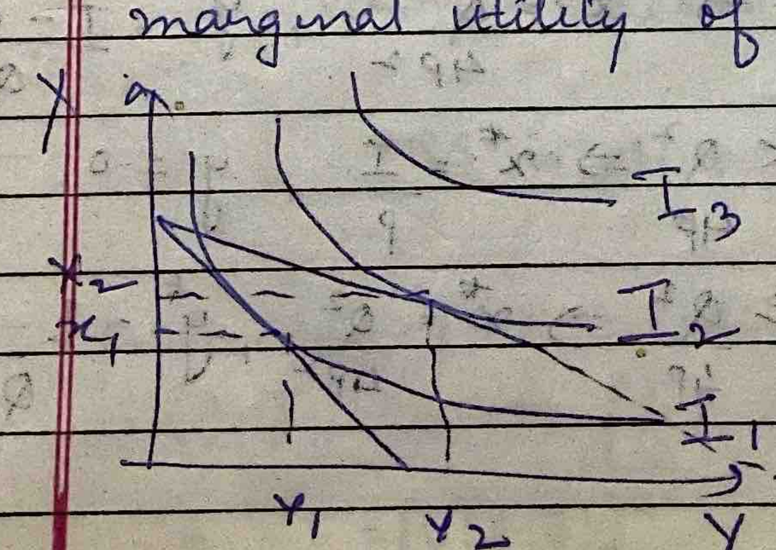
$U(x_1, x_2) = V(P_1, P_2, I)$ ← indirect utility func^n

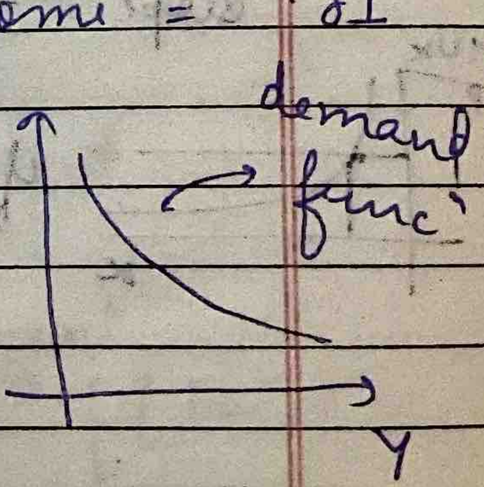


Eg. $U(x_1, x_2) = \min(x_1, x_2)$

$x_1^* = \frac{I}{P_1 + P_2} = x_2^*$

- marginal utility of income $= \partial U / \partial I$





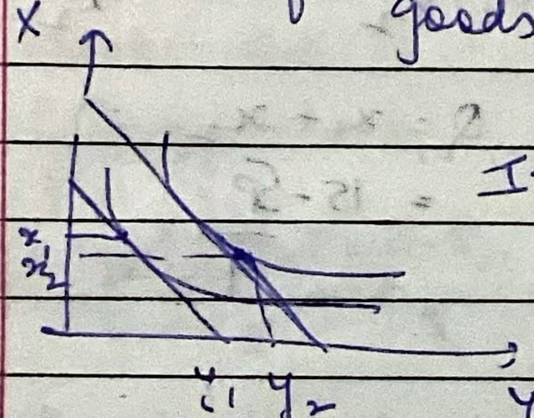
- effect of price Δ ⇒ substitu^n effect
  because of Δ in relative attractiveness
  change in real income
  income effect.

$P_y \downarrow$ ⇒ substitu^n effect will say you consume more of this item

income can go in any direc^n

I → Normal goods ⇒ I ↑, consump^n ↑

I → inferior goods ⇒ I ↑, consump^n ↓

- 

I ↑ ⇒ Y ↑ Normal

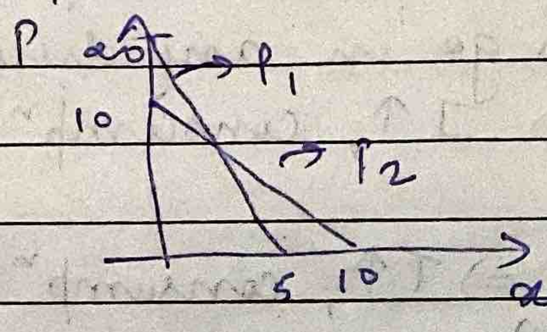
X ↓ inferior

- Factors for demand func^n
  1 → Taste/preferences
  2 → Income
  3 → Prices of other good
     substitute → Price ↑, W ↑
     compliment → X ↑, Y ↓
  4 → expecta^n 5 → popula^n
- Normal good → substitu^n ↑
  inferior (opp.) income effect ↑

- Inf. → income effect is greater than substitutⁿ effect ⇒ Giffen goods

$Q = Q(P)$ → demand funcⁿ
$P = P(Q)$ → inverse demand funcⁿ

Eg. $P_1 = 20 - 4x_1$ $\quad P_2 = 10 - x_2$



$P \geq 20 \Rightarrow Q = x_1 + x_2 = 0$

$10 \leq P \leq 20 \Rightarrow x_1 = 5 - \frac{P}{4}$

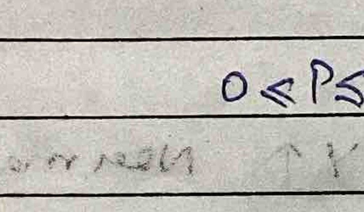
$x_2 = 0$

$0 \leq P \leq 10 \Rightarrow Q = x_1 + x_2$

$= 15 - \frac{5P}{4}$

L4 Demand, Supply & Market Eqᵐ

- Consumer Surplus



$P = 10 - x$

$x = 10 - P$

$x = 10 - 4 = 6$

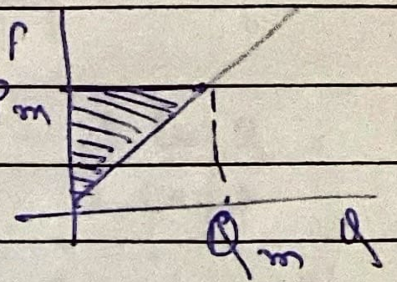
Surplus $= \frac{1}{2} \times \cancel{6}^{3} \times 6 = 18$ units

- factors affecting supply func^n

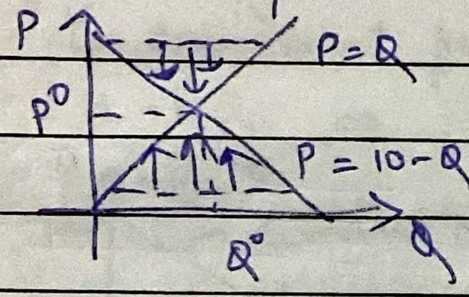
$$\min_{(x_1, x_2)} w_1x_1 + w_2x_2 \quad s.t. \quad f(x_1, x_2) \geq y$$

1. technology 2. input cost
3. prices of complement & substitute goods in produc^n 4. weather / expecta^{ns}
5. no. of suppliers

- Producer surplus



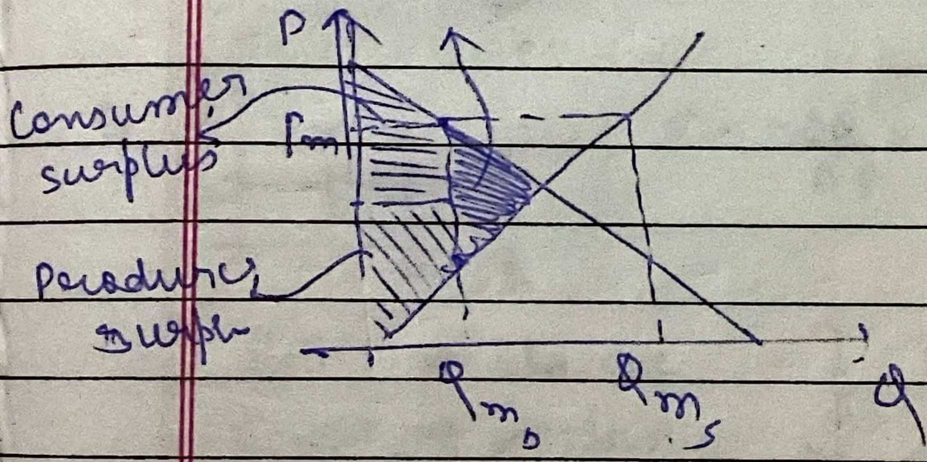
- Market eq^m



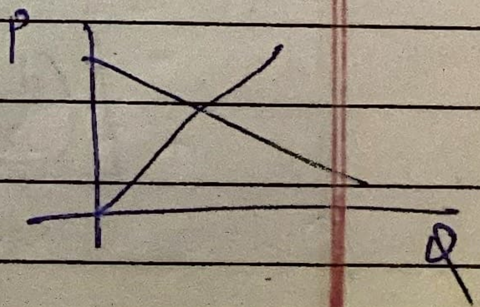
$(P^*, Q^*) = (5, 5)$

at any other price market doesn't clear.

- Dead wt. loss



- Δs in market eq^m



Luxury good ⇒ weblin good

	P^*	Q^*
D ↑	↑	↑
D ↓	↓	↓
S ↑	↓	↑
S ↓	↑	↓

	P^*	Q^*
D↑ & S↑	—	↑
D↑ & S↓	↑	—