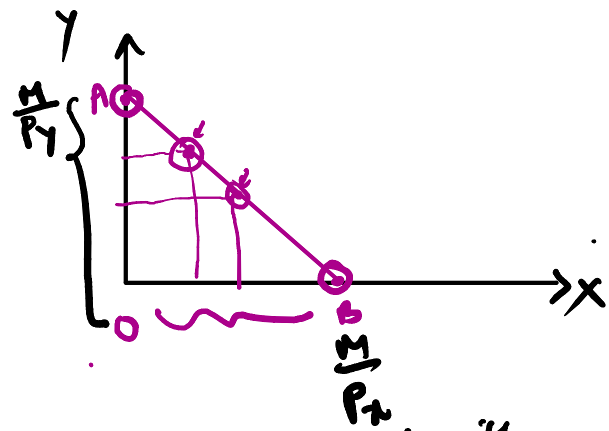
02 February 2024 07:04 PM

Budget Line



$$\boxed{M = xP_x + yP_y}$$ → Budget equation.

$$\frac{dM}{dx} = P_x + \frac{dy}{dx} \cdot P_y$$

(∵ income is constant)

$$\frac{dM}{dx} = 0$$

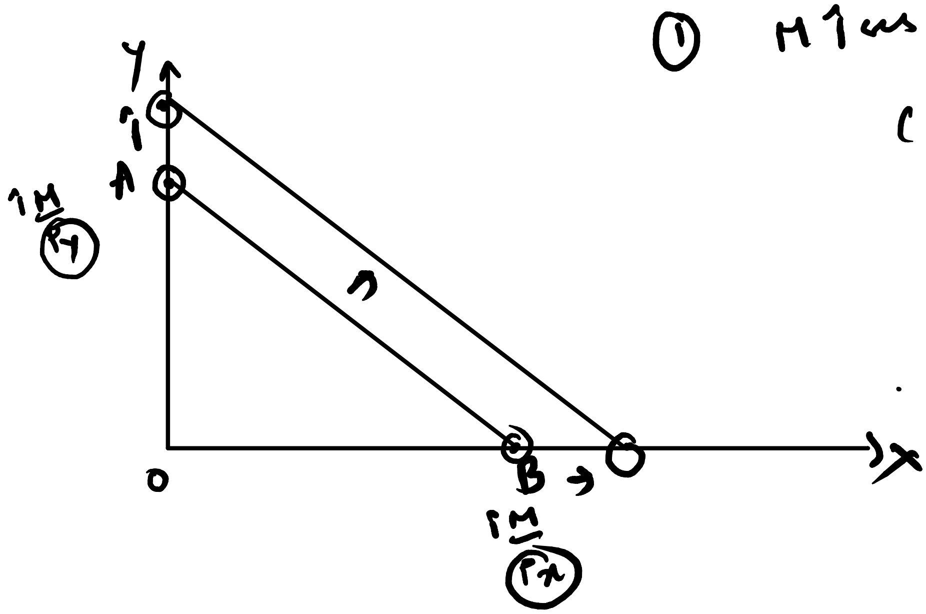
$$P_x + \frac{dy}{dx} \cdot P_y = 0$$

OA → max Y purchased with income M, when purchase of X unit is 0.

OB → max X purchased with income M, when purchase of Y unit is 0.

slope → $\frac{dy}{dx} = -\frac{P_x}{P_y} < 0$

it means for 1 unit increase in purchase of X, purchase of Y will decrease by $\frac{P_x}{P_y}$ units



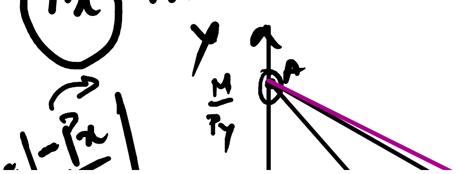
① M ↑es and Price of x and y is constant.

(parallel shift rightwards)

slope remains same ($-P_x/P_y < 0$).

② P_x increases and M as well as P_y is constant

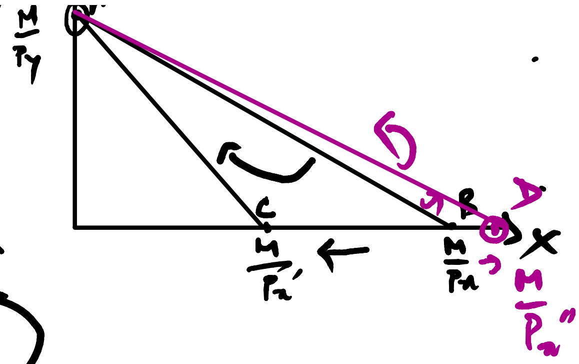
Budget line will rotate clockwise to AC.



clockwise to AC

slope = $\left|-\frac{P_x}{P_y}\right|$

slope will increase steeper



* P_x decreases → Budget line will rotate anti-clockwise to AD.

↓ slope will decrease (flatter)

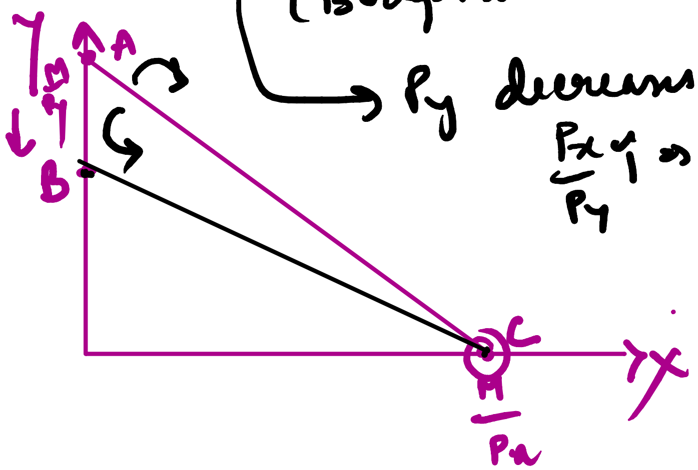
P_x/P_y ↓ flatter

③ P_y increases, with M and P_x constant

(Budget line rotates anti-clockwise).

→ P_y decreases → then budget line will rotate clockwise.

$\frac{P_x}{P_y}$ ↑ → steeper.



④ (Suppose M, P_x and P_y all factors increases twice)

Budget line remain same.

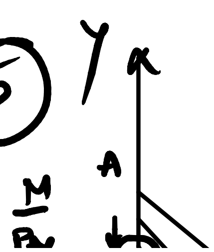
$\frac{\cancel{2}M}{\cancel{2}P_x}$ $\frac{\frac{1}{2}M}{\cancel{2}P_y}$

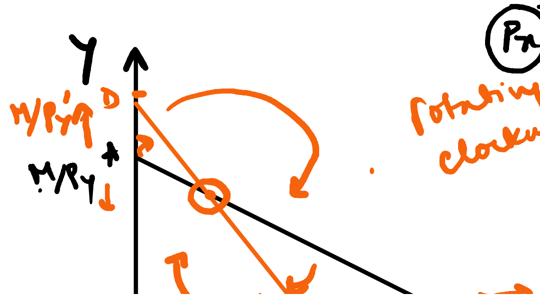
$\frac{2P_x}{\cancel{2}P_y}$

$\cancel{2}M = \cancel{2}P_x \cdot x + \cancel{2}P_y \cdot y$

P_x and P_y decrease. (→ increase)

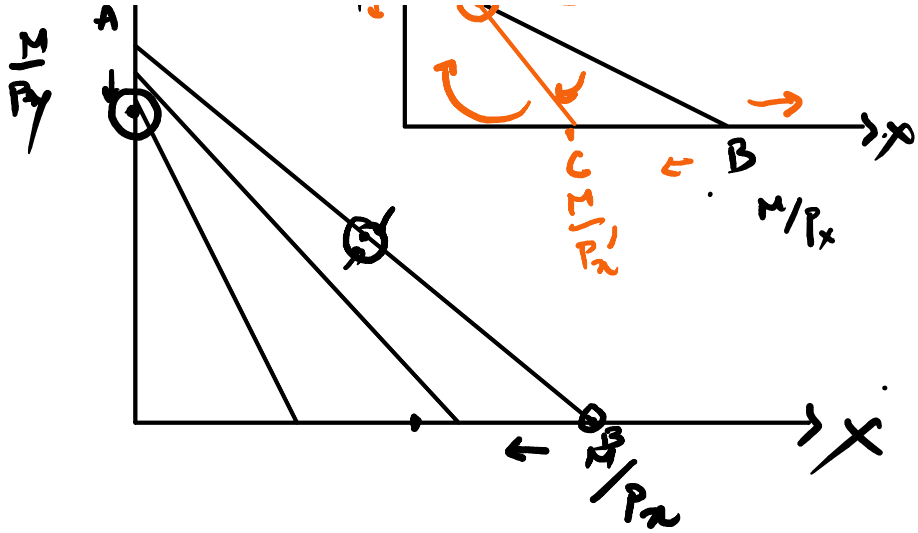
⑤





rotating clockwise.

M is constant both P_x and P_y increases

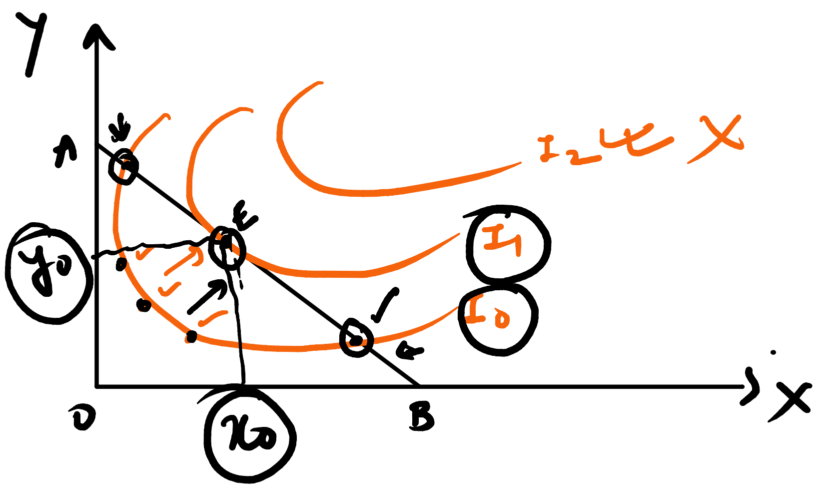


both (P_x) and (P_y) increases.

P_x/P_y same

parallel shift.

Consumer's Equilibrium:



at pt E, optimum amount of x and y are consumed ox_0 and oy_0.

at consumer's equilibrium

slope of IC = slope of Budget line

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

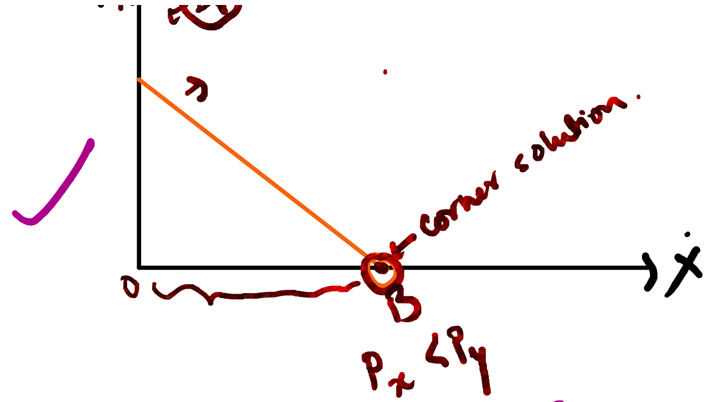
$$\boxed{MRS_{x,y} = \frac{P_x}{P_y}}$$

Is tangency condition necessary as well as sufficient for consumer's equilibrium?

In case of perfect substitutes.

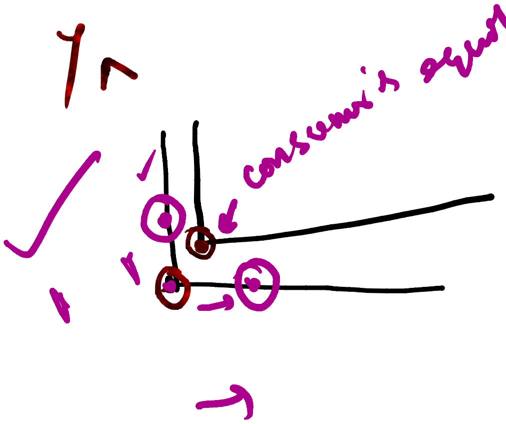
Budget line → P_x/P_y

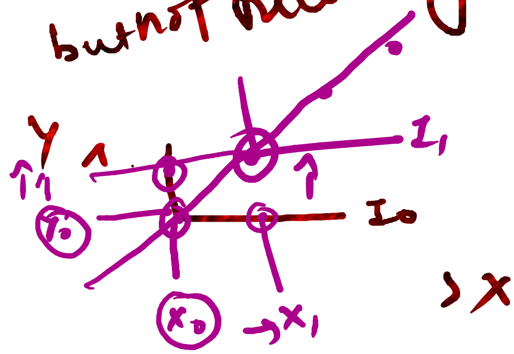
(At corner solution ... will not hold ...)



{ At corner solution the tangency condition will not hold ~ (slope of IC ≠ slope of BL) }

"Tangency condition is sufficiency condition but not necessary".

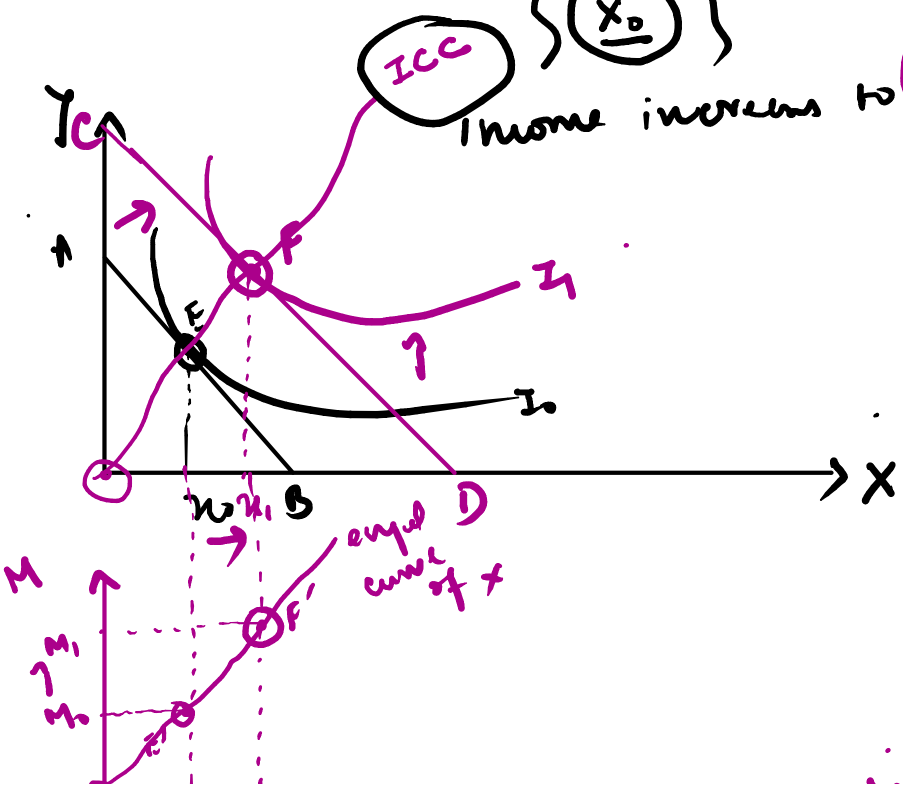




Income consumption curve (ICC) of commodity X.

initial income (M_0) (X_0) → Budget line (AB)

Income increases to (M_1) (X_1) → Budget line shift to CD



Derive ICC?

Given $U = xy$
M is income P_x, P_y ....

$U = XY \rightarrow MRS = \frac{MU_X}{MU_Y} = \frac{Y}{X}$

$MU_X = Y$ $MU_Y = X$

Objective is to maximise $U = xy$
subj to $M = x \cdot P_x + y \cdot P_y$.

At equil
$MRS = \frac{P_x}{P_y}$

$Y/X = \frac{P_x}{P_y}$

$L = xy + \lambda(M - x \cdot P_x - y \cdot P_y)$

$y - P_x\lambda = 0$

$\frac{\partial L}{\partial x} = 0 \Rightarrow \lambda = y/P_x$ — (1)

$\frac{\partial L}{\partial y} = 0 \Rightarrow \lambda = \frac{x}{P_y}$ — (2)

$\frac{\partial L}{\partial \lambda} = 0 \Rightarrow M = xP_x + yP_x$ — (3)

compare (1) and (2)

$\boxed{y/P_x = x/P_y}$ ← consumer's equilibrium

we have got, $\frac{Y}{X} = \frac{P_x}{P_y}$

$\boxed{Y = \frac{P_x}{P_y} \cdot x}$

or, $\boxed{YP_y - xP_x = 0}$

↳ equation of ICC

Slope of ICC is $\frac{dy}{dx} = \frac{P_x}{P_y} > 0$

in this case ICC is an upward sloping straight line passing through the origin.

$M = P_x \cdot x + P_y \cdot y$

Putting $y = \frac{P_x}{P_y} \cdot x$ we get

$M = P_x \cdot x + \cancel{P_y} \cdot \frac{P_x}{\cancel{P_y}} \cdot x$

$\boxed{M = 2P_x \cdot x}$ — equation of an engel curve of X

$\frac{dm}{dx} = 2P_x > 0$

engel curve is ... sloping line

a.n Engel curve
∴ Engel curve upward sloping straight line passing through the origin.