12 March 2024 08:26 PM

② income elasticity of demand:

$$e_m^x = \frac{\%\text{ change in } Q^x}{\%\text{ change in income}}$$

$$= \frac{dQ}{dm} \times \frac{m}{Q}$$

① $e_m^x < 0 \Rightarrow \frac{dQ}{dm} < 0 \Rightarrow$ inferior good

② $e_m^x = 0 \Rightarrow \frac{dQ}{dm} = 0 \Rightarrow$ neutral goods

③ $e_m^x > 0 \Rightarrow \frac{dQ}{dm} > 0 \Rightarrow$ Normal goods

a) $0 < e_m^x < 1$

(normal necessary goods)

b) $e_m^x > 1$

(Luxury goods).

Cross price elasticity of demand

$$e_c^{x,y} = \frac{\%\text{ change in quant demand for } X}{\%\text{ change in price of } Y}$$

$$= \boxed{\frac{dQ^x}{dP_y} \times \frac{P_y}{Q_x}}$$

$Y\uparrow \Rightarrow X\uparrow$

$P_y\downarrow$

a) $e_c^{x,y} < 0 \Rightarrow \frac{dQ^x}{dP} < 0 \Rightarrow$ complementary goods

a) $e_c^{x,y} < 0 \Rightarrow \frac{dq}{dP_y} < 0 \Rightarrow$ complementary goods

b) $e_c^{x,y} > 0 \Rightarrow \frac{dq^x}{dP_y} > 0 \Rightarrow$ substitute goods.

c) $e_c^{x,y} = 0 \Rightarrow \frac{dq^x}{dP_y} = 0 \Rightarrow$ indp / unrelated goods.

Q. The demand function for a commodity is given by $X_1 = 300 - 0.5P_1^2 + 0.02P_2 + 0.05Y$

Find the income elasticity of demand when $P_1 = 12$, $P_2 = 10$ and $Y = 200$

$$\frac{\partial X_1}{\partial Y} = 0.05$$

$$X_1 = 300 - 0.5(12)^2 + 0.02(10) + 0.05(200)$$

$$= 237.8$$

$$\therefore e_m^x = \frac{\partial X_1}{\partial Y} \times \frac{Y}{X_1} = \frac{0.05 \times 200}{237.8} = 0.042 \text{ (app)}$$

$\Rightarrow e_m^x > 0$

$\therefore X_1$ is a normal necessary good.

Q2. The following are two demand functions for two commodities X_1 and X_2:

$-1.7 \quad 0.8 \quad 0.5 \quad -0.8$

two commodities x_1 and x_2

$$x_1 = p_1^{-1.7} p_2^{0.8}, \quad x_2 = p_1^{0.5} p_2^{-0.8}$$

Determine whether the two commodities are compliments or substitutes.

$$\left.\begin{aligned} \frac{\partial x_1}{\partial p_2} &= p_1^{-1.7}\, 0.8\, p_2^{-0.2} > 0 \\ \frac{\partial x_2}{\partial p_1} &= 0.5\, p_1^{-0.5}\, p_2^{-0.8} > 0 \end{aligned}\right\} \text{ substitute goods.}$$

Q3 A consumer's demand curve for x is given by

$$P = 100 - \sqrt{Q}.$$

Calculate his point elasticity of demand when the price of x is 60.

$$P = 100 - \sqrt{Q}$$

$$\sqrt{Q} = 100 - P$$

$$Q = (100 - P)^2$$

$P = 60$.

$\therefore \sqrt{Q} = 100 - 60 = 40$

$Q = 1600$

$$\therefore \frac{\partial Q}{\partial P} = -2(100 - P)$$

$$\therefore e_p^x = \frac{\partial Q}{\partial P} \times \frac{P}{Q}$$

$= -2(100-P) \times \frac{60}{1600}$

$= \frac{-\cancel{2} \times \cancel{40} \times \cancel{60}^{3}}{\cancel{4}\cancel{1600}_{2}}$

$= -3$

$|e_p^x| = 3 > 1 \Rightarrow$ elastic demand.

Production and cost

Short-run Concept

(fixed and variable inputs are used)

$Q = f(L, \bar{K})$ or $f(L)$
where $K = \bar{K}$ = fixed capital.

and Long run production fn.
(all factors are variable.
No fixed factors are used).

$Q = f(L, K)$.

$TP_L = Q$ = final output)

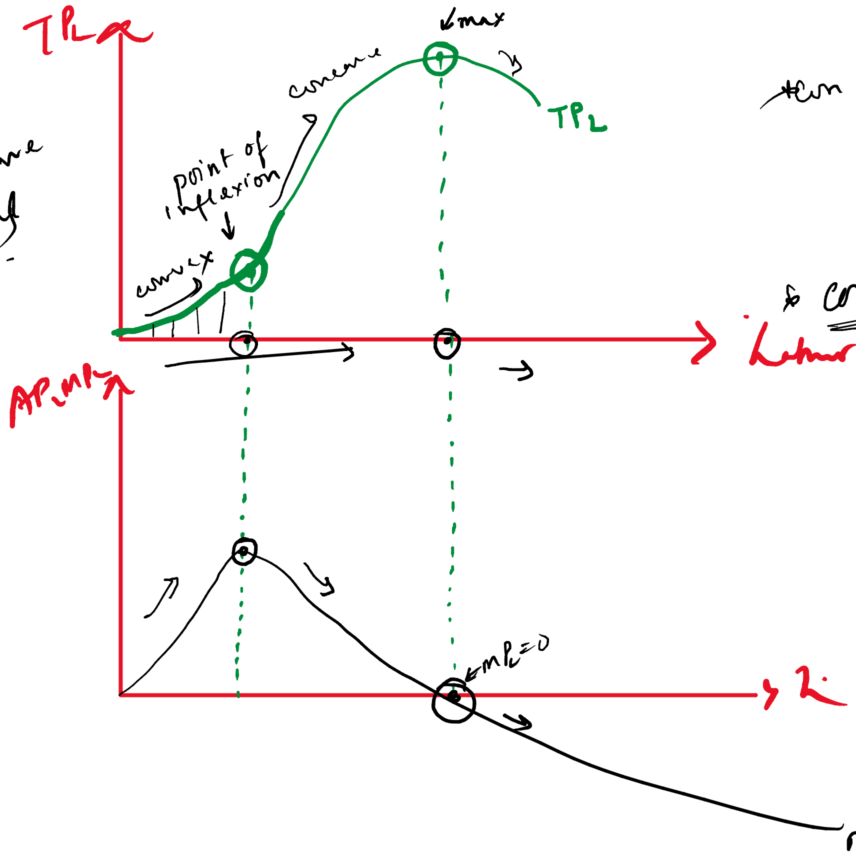
$AP_L = TP_L / L = Q/L$

$MP_L = \frac{\partial Q}{\partial L}$

relation between TP_L and MP_L

What is the relation between TP_L and MP_L

point of inflexion is the point where the curve changes its curvature.



convex ⇒ s.o.D is > 0 (increasing) change at an increasing rate.

& concave ⇒ s.o.D < 0 (decreasing) change at a decreasing rate.

10 → 20 → 28 → 35

10 8 7

1. TP_L first increases at an increasing rate (convex)
   ⇒ change is increasing
   ⇒ $MP_L > 0$ and increasing.

2. At point of inflexion ⇒ MP_L is max (change is max)

3. TP_L then increases at decreasing rate (concave)
   ⇒ change is +ve but decreasing
   ⇒ $MP_L > 0$ but falling.

4. TP_L reaches maximum ⇒ $MP_L = 0$ (no change)

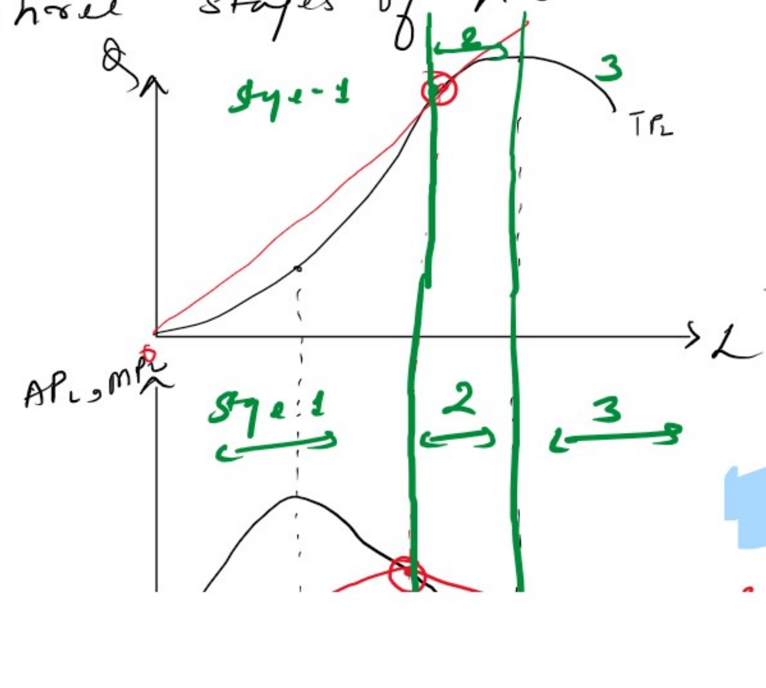
5. further labour employment ⇒ fall in production (TP_L)
   ⇒ $MP_L < 0$.

Law of Diminishing MP_L or Law of variable proportion.
(This is return to a factor
⇒ Short-run concept)

If Labour is the only variable factor of production increased on all other fixed variable of production, then TP_L initially increases, then it falls as a result change is diminishing ⇒ MP_L is diminishing.

On fixed input, Labour is increased such that the K/L ratio keeps changing. This is known as law of variable proportion.

Three stages of Production

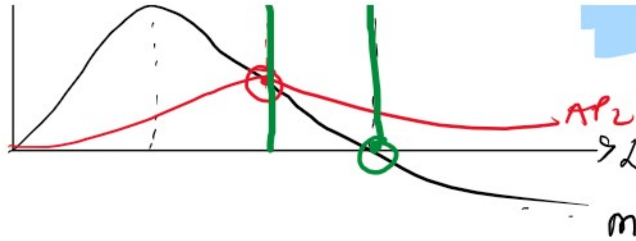


Q/L AP_L

Stage 1

① TP_L is increasing ⇒ MP_L is max and increasing, $MP > AP_L$

increasing return



returns

$MP > AP_L$

(2) TP_L is max

diminishing returns $\Rightarrow AP_L \geq MP_L$

$\Rightarrow AP_L$ falling

$\Rightarrow MP_L = 0$

(3) TP_L is falling

$\Rightarrow MP_L < 0$

(negative returns)

MP_L and AP_L

(1) When AP_L is rising $\Rightarrow MP_L > AP_L$

(2) At max $AP_L \Rightarrow MP_L = AP_L$

(3) When AP_L is falling $\Rightarrow MP_L < AP_L$

Short-run Production $Q = f(L, \bar{K})$

$$\boxed{TC = f(Q) = wL + Kr}$$

cost of variable input

TVC

+ cost of fixed input

(TFC)

$\therefore TC = TVC + TFC.$

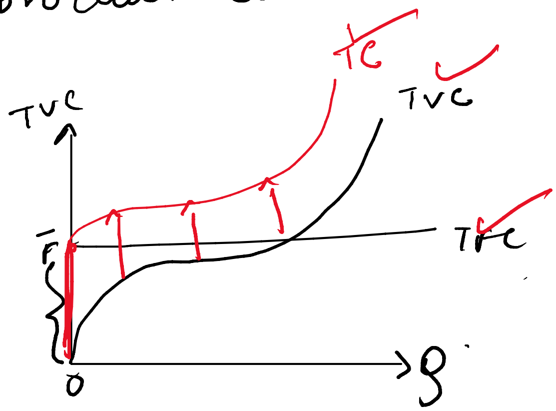
(2) $\frac{TC}{Q} = \frac{TVC}{Q} + \frac{TFC}{Q}$

$ATC = AVC + AFC$

Short run
Cost curves are the reflection of product curve.

(3) $MC = \frac{\partial TC}{\partial Q} = \frac{\partial TVC}{\partial Q}$

of product curve.



(3) $MC = \dfrac{\partial TC}{\partial Q} = \dfrac{\partial TVC}{\partial Q}$

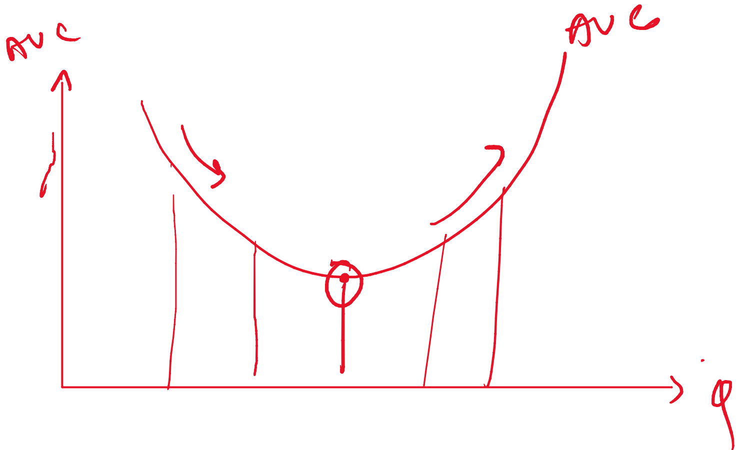
as $Q=0 \Rightarrow TVC=0$

$TFC = O\bar{F}$ (indp of Q)

$TC = TVC + TFC$

$Q=0$ $\boxed{TC = TFC}$

AVC and AFC → AC.



$AVC = \dfrac{TVC\uparrow}{Q\uparrow}$

$\dfrac{TVC}{Q\uparrow}$