Abhay ECO507 Homework-1 180014.

Ans 1.

- (x_1,y_1) and (x_2,y_2) : $x_1 > x_2 \Rightarrow (x_1,y_1) \succ (x_2,y_2)$
- (x_1,y_1) and (x_2,y_2) : $x_1 = x_2$, $y_1 > y_2 \Rightarrow (x_1,y_1) \succ (x_2,y_2)$

a.) This preference satisfies the monotonicity assumptions. This is because more is better. The utility increases with increase in x, or y or both.

b.) It is clear that individual/consumer prefer more 'x' as compared to ~~y~~ 'y'.

Hence, he will prefer x over y, thus buying only x from his total income.

Let the prices of x & y be p_x and p_y. Also, income be M.

$$\therefore \quad p_x x + p_y \cdot y = M \longrightarrow \text{budget constraint}$$

Since, he prefer only x,

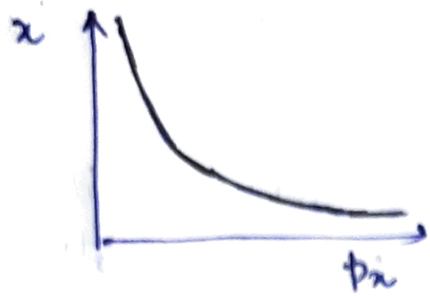
$$\therefore \quad y^* = 0 \quad , \quad p_x \cdot x^* = M$$
$$\Rightarrow x^* = \frac{M}{p_x}.$$

Thus, demand f^ns

$$y = 0$$
$$x = \frac{M}{p_x}$$

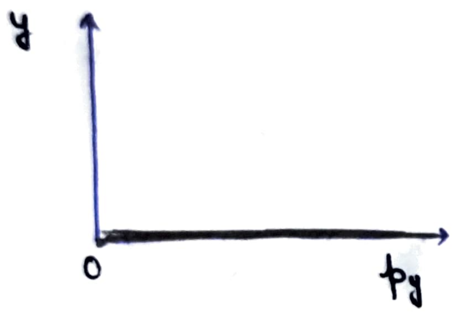
c.) Graph for demand f^n

$\left(x = \frac{M}{p_x}\right)$



Shape = Rectangular Hyperbola

$(y = 0)$



Shape = Straight Line.

Ans 2. Given 2 goods x and y, with prices p_x and p_y.

Individual utility function is given by

$$u(x,y) = \min\{2x, 3y\}$$

Assuming income be M, budget constraint is given by

$$p_x \cdot x + p_y \cdot y = M$$

Case (i) $2x < 3y$

$\Rightarrow u(x,y) = 2x$

$\Rightarrow x = \frac{u}{2}$

(ii) $2x > 3y$

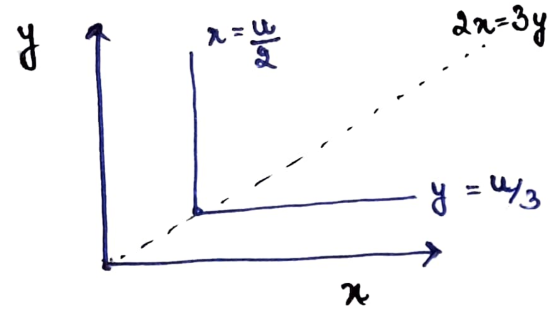
$\Rightarrow u(x,y) = 3y$

$\Rightarrow y = \frac{u}{3}$

(iii) $2x = 3y$

$\Rightarrow u = 2x = 3y$

Indifference curve here would be



→ This form an L shaped curve with intersection point at $(\frac{u}{2}, \frac{u}{3})$ for every given value of u..

→ Intersection pt. for any u wills lie on line $2x = 3y$.

Thus $2x^* = 3y^*$

Subsitituting this in budget equation

$\Rightarrow p_x x^* + p_y y^* = M$

$\Rightarrow p_x x^* + p_y \frac{2x^*}{3} = M$

$\Rightarrow x^* = \frac{3M}{3p_x + 2p_y}$

$\Rightarrow y^* = \frac{2M}{3p_x + 2p_y}$.

Ans 3.

Given goods x and y with prices p_x and p_y.

$u(x,y) = 2x + 3y \longrightarrow$ utility function

Condⁿ for optimum $\left|\frac{p_x}{p_y}\right| = |MRTS| = \frac{2}{3}$

Case 1 if $\left|\frac{p_x}{p_y}\right| > \frac{2}{3}$

here consumer will buy all y, none of x

$\Rightarrow \quad p_y y = M$

$\Rightarrow \quad y = \frac{M}{p_y}, \quad x = 0$

Case 2 if $\left|\frac{p_x}{p_y}\right| < \frac{2}{3}$

Consumer buy only x and none of y.

$\Rightarrow \quad p_x \cdot x = M$

$\Rightarrow \quad x = \frac{M}{p_x}, \quad y = 0$

Case 3 if $\left|\frac{p_x}{p_y}\right| = \frac{2}{3}$

Consumer is indifferent across all pts. on budget line, hence can choose any bundle on budget eqⁿ, $x p_x + p_y y = M$.

Ans 4.

$Q = K^{2/3} L^{1/3}$

wage rate = \$15 per hour = p_L
cost of capital = \$1920 per unit = p_K.

since K = 1 , thus

$Q = L^{1/3}$

$C = p_K K + p_L \cdot L$

$C = (1920 \times 1 + 15 \cdot L)\ \$$

Putting value of $Q = L^{1/3}$, we get

$C = 1920 + 15Q^3$

a.) Marginal cost.

$M \cdot C = \frac{\partial C}{\partial q} = 0 + 3 \times 15 Q^2 = 45 \times L^{2/3}$

substituting L = 8 ; $MC = 45 \times (8)^{2/3}$
$= \boxed{\$180}$

b.) ~~MRTS = $\frac{MP_K}{MP_L}$ =~~

$TRS = \frac{MP_K}{MP_L} = \frac{\partial Q / \partial K}{\partial Q / \partial L} = \frac{2/3 K^{-1/3} L^{1/3}}{1/3 K^{2/3} L^{-2/3}} = \frac{2L}{K}$

$= 2 \times 8$

$= \boxed{16}$

c.) For optimal, consumer will behave optimally at AC_{min}

$AC = \frac{1920}{Q} + 15Q^2$

$\frac{\partial AC}{\partial Q} = 0$ for optimal condn

however, here L = 8hrs
thus NOT OPTIMAL.

↳ $-\frac{1920}{Q^2} + 30Q = 0$

↳ $Q^3 = \frac{192}{3} = 64$

↳ $Q = 4$ ∴ for optimal behaviour ⇒ $L = Q^3 = 64$hrs.

Ans 5.

$C = q^3 - 4q^2 + 8q$ → Cost function

$D = 2000 - 100p$ → Market Demand

Since, long run perfect market equillibrium,
thus market is operating $(Av.C)_{min}$.

$$Av.C = \frac{C}{q} = q^2 - 4q + 8$$

$$\frac{\partial\, Av.C}{\partial q} = 0 \quad \text{for minima}$$

$$0 = 2q - 4$$

$$\Rightarrow q = 2.$$

$$p = (Av.C)_{min} = 2^2 - 4 \times 2 + 8$$
$$= 4$$

a.) Equilibrium price ⇒ $p_{eq.} = (Av.C)_{min} = 4$ units

b.) Agregate quantity in eq. ⇒ ~~q = 2 units~~

$$D = 2000 - 100p_{eq.}$$
$$= 2000 - 100 \times 4$$
$$= 1600 \text{ units}$$

c.) No. of firms $= \dfrac{\text{Aggregate quantity}}{\text{each firm quant.}} = \dfrac{1600}{2} = \underline{\underline{800}}$

d.) Amount by each firm $= q = \underline{\underline{2 \text{ units}}}$

Ans6.

Market demand :- $D = 80 - 2p$

Market supply :- $S = 40 + 6p$

a.) At equillibrium, each of $S = D = q$

$$80 - 2p = 40 + 6p = q_d = q_s = q$$

$$\Rightarrow 8p = 40$$

$$\Rightarrow p = 5$$

$$S = q = D = 80 - 2p = 70$$

$\therefore$ $\boxed{\begin{array}{l} \text{eq. price} = 5 \text{ units} \\ \text{eq. quantity} = 70 \end{array}}$ $\approx$ \$5 (from next part)

b.) tax of \$1 per unit of output is levied.

$\therefore$ supply func :- $Q_s = 40 + 6p$

$$\Rightarrow p = \frac{q_s - 40}{6}$$

so tax is levied, thus price ↑ by \$1

$$\therefore \quad p = \frac{q_s - 40}{6} + 1$$

$$\therefore \quad q_s = 6p - 6 + 40 = 6p + 34$$

$$q_d = 80 - 2p$$
$$q_s = 6p + 34$$

for eq $q_d = q_s = q$

$$80 - 2p = 6p + 34$$

$$8p = 46$$

$$\Rightarrow p = \$5.75$$

$$q_d = q_s = 6 \times 5.75 + 34$$
$$= 68.5$$

$\therefore$ $\boxed{\begin{array}{l} \text{eq. price} = \$5.75 \\ \text{eq. quantity} = 68.5 \end{array}}$

Thus.

Change in eq price

$(\Delta p)_{eq} = \$0.75$

Change in eq. quantity

$(\Delta q) = 68.5 - 70$

$= -1.5$