Cardinal Utility Theory

Consumer

The one who takes **decisions** about what to buy for the **satisfaction of wants**, both as an individual and as a member of the household, is called a consumer.

Rational Consumer

A consumer who seeks to **maximize utility or satisfaction** in spending his income is called a rational consumer.

Consumer's Equilibrium

Consumer's Equilibrium refers to the situation when a consumer is having maximum satisfaction with limited income and has no tendency to change his way of existing expenditure

Cardinal Utility theory

Assumptions:

(i) Consumer is rational as he wants to maximize his total utility.

(ii) Utility is cardinally measured as one, two, three, and so on.

(iii) Marginal utility of money is constant. and

(iv) As more and more units of a commodity are consumed, the utility from each additional unit falls.

Consumer's equilibrium can be discussed under two different situations:

1. Consumer spends his entire income on a single commodity.
2. Consumer spends his entire income on two commodities.

Equilibrium Condition for a Single Commodity

A consumer purchasing a single commodity will be at equilibrium, when he is buying such a quantity of that commodity, which gives him maximum satisfaction.

The number of units to be consumed will depend on:

1. Price of the given commodity
2. Expected utility (MU) from each successive unit.

To determine the equilibrium point, consumer compares the price (or cost) of the given commodity with its)utility (satisfaction

Being a rational consumer, he will be at equilibrium when marginal utility is equal to the price of the commodity.

Marginal utility is expressed in utils and price is expressed in terms of money. However, MU and price can be effectively compared only when both are stated in same units. Therefore, MU in utils is expressed in terms of money.

MU in terms of money, that is, **MUx(money) =** $\frac{\text{MU inutils}}{\text{MU of one rupee (MUm)}}$

Equilibrium condition can be written as:

$$\frac{\text{MU} \times (\text{Utils}) = \text{Price of commodity "X"}}{\text{MU of a rupee}}$$

OR $MU_x = P_x$

Case 1: MU_x (money) > P_x

If MU_x (money) > P_x, consumer keeps on consuming more units. When he consumes more unit, the additional utility derived from consuming X keeps on falling. He keeps on consuming till MU_x (money) = P_x.

Case 2: MU_x (money) < P_x

If MU_x (money) < P_x, he will decrease the consumption of X. When he decreases the consumption of X, the marginal utility of X will increase. He will keep on decreasing consumption of X till MU_x (money) = P_x.

Thus, MU_x (money) = P_x is the condition for consumer's equilibrium in a single commodity case.

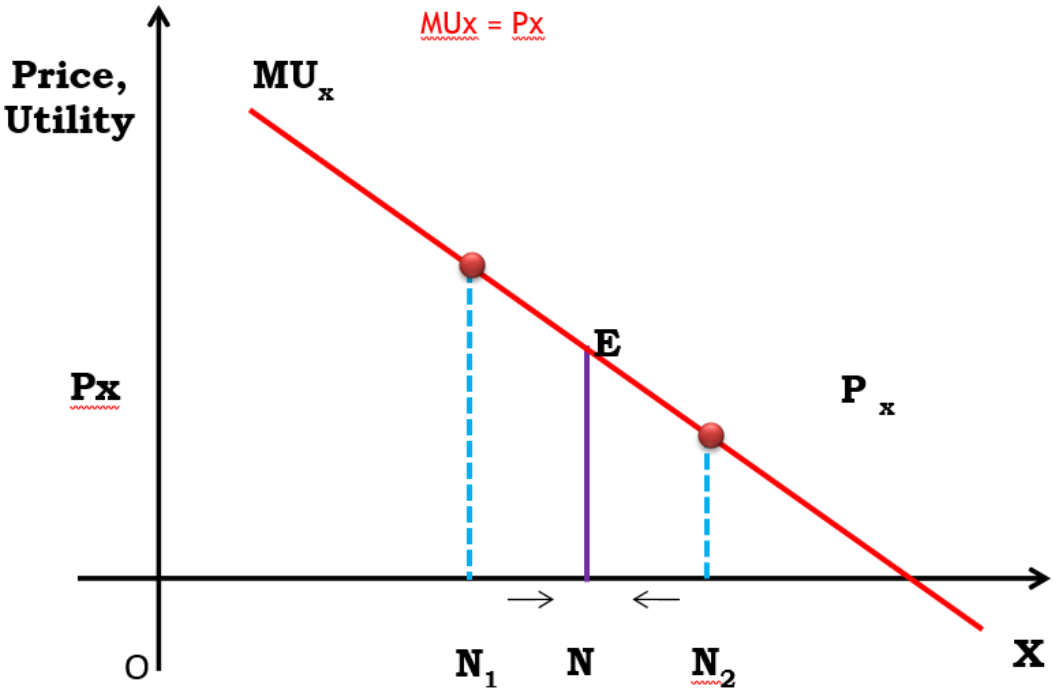
Let's understand the equilibrium through an illustration.

Taking MU_m = 2 utils.(1 rs =2 utils)

Oranges consumed	MU (Utils)	MU in terms of money	Price(Rs.)	Gain	Direction of change
0	0	0	1	-	
1	8	8/2 = 4	1	3	↑ Consumption
2	6	6/2 = 3	1	2	↑ Consumption
3	4	4/2 = 2	1	1	↑ consumption

4	2	2/2 = 1	1	0	ATTAINS EQUILIBRIUM
5	0	0/2 = 0	1	-1	↓ Consumption
6	-2	-2/2 = -1	1	-2	↓ Consumption

Consumer equilibrium is attained when the consumer is consuming 4 units of oranges.



Consumer's Equilibrium for Two Commodities

In such a situation, **Law of Equi-Marginal Utility** helps in optimum allocation of his income.

According to Law of Equi-Marginal utility, a consumer gets maximum satisfaction, when ratios of MU of two commodities and their respective prices are equal and MU falls as consumption increases.

Or

It states that the last rupee (spent) gives him equal marginal utility whether he spends it on Good X or Good Y.

Thus, the conditions are:

1. Per rupee MU from consumption of each good is same, ie.

$$\frac{MU_x \text{ (Utils)}}{Px} = \frac{MU_y \text{ (Utils)}}{Py} \quad \text{or} \quad (Mux = MUy)$$

2. MU falls as consumption rises.
   If MU does not fall, the consumer will end up buying only one good which is unrealistic and consumer will never reach the equilibrium position.

Case 1

MUx/Px > MUy/Py

a. MU from the last rupee spent on X > MU from the last rupee spent on Y.
b. Consumer buys more of X and less of Y.
c. MU derived from consuming X decreases due to law of DMU.
d. He keeps on consuming X till:

MUx/Px = MUy/Py

Case 2

MUx/Px < MUy/Py

a. MU from the last rupee spent on X < MU from the last rupee spent on Y.
b. Consumer buys more of Y and less of X.
c. MU derived from consuming Y decreases due to law of DMU.
d. He keeps on consuming Y till:

MUx/Px = MUy/Py

Limitations of Utility Analysis

1. **Cardinal Measurement is arguable**: Utility cannot be measured, for utility is a subjective concept, it exists only in the mind of man.
2. **Diminishing MU of money**: Critics point out that MU of money never remains constant, because MU does fall when its stock increases and vice-versa.
3. **Unrealistic comparison of marginal utility**: This law assumes that it is possible for a consumer to compare the MU from every successive unit of a commodity. But actually, such comparison is not at all possible.

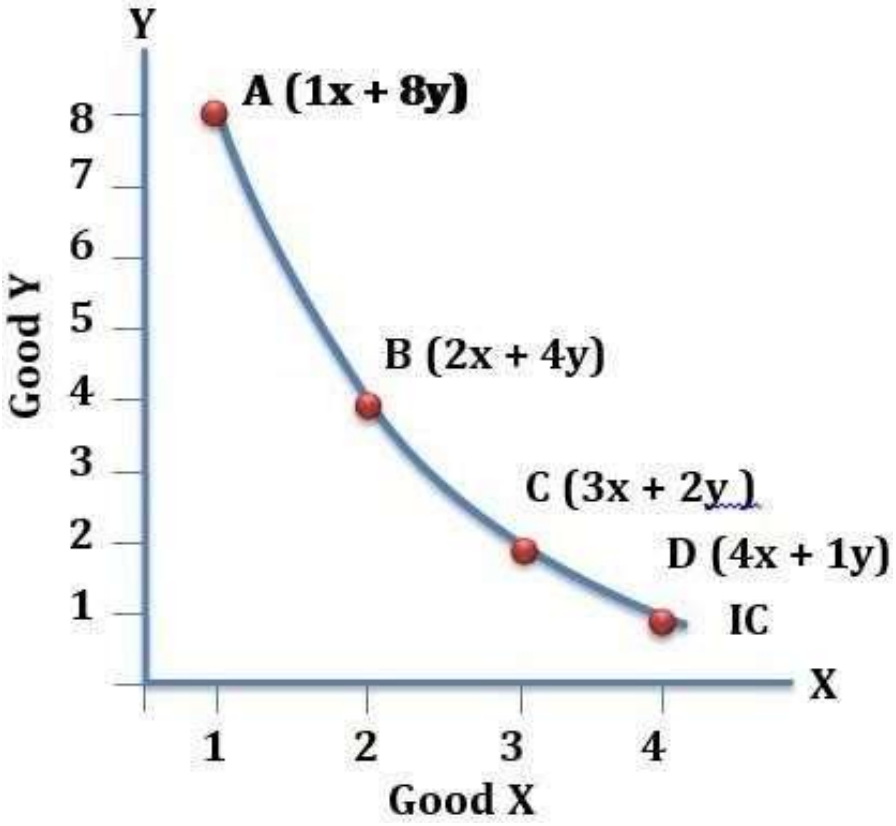
Ordinal Utility Theory

Ordinal Utility Analysis

This approach it makes use of ordinal numbers like 1st, 2nd, 4th, etc. which be used only for ranking.

Meaning of Indifference Curve

Indifference curve refers to the **graphical representation** of various alternative combinations of the goods, which provide **same level of satisfaction** to the consumer.



Combination	Good X	Good Y
A	1	8
B	2	4
C	3	2
D	4	1

Consumer is indifferent between four combinations of good X and Y.

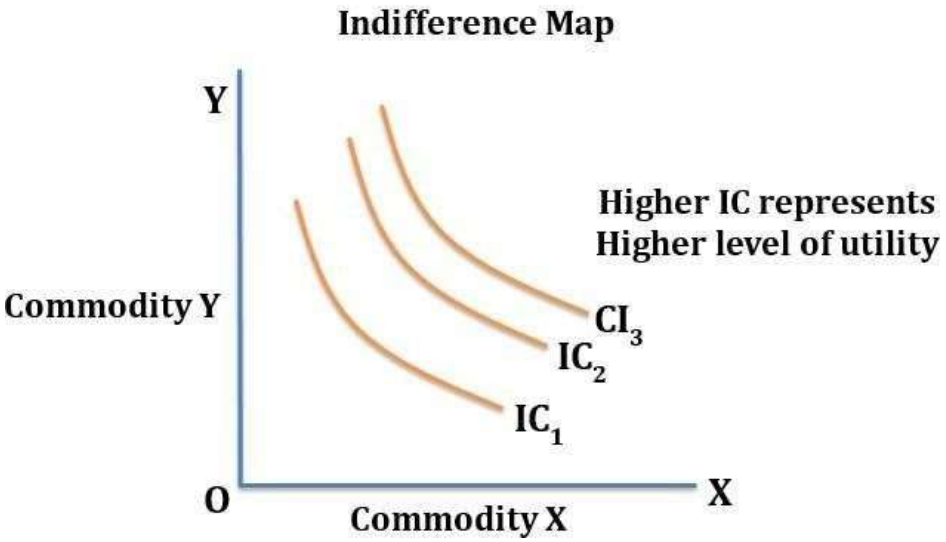
Useful Concepts of Indifference Curve Analysis

Meaning of Indifference Set

The **combinations** A, B, C and D give equal satisfaction to the consumer and therefore he is indifferent among them. These combinations are together known as 'Indifference Set'.

Meaning of Indifference Map

Indifference Map refers to the **family of indifference curves** that represent consumer preference over all the bundles of the two goods.



Marginal Rate of Substitution

MRS is defined as the amount of one good the consumer is willing to give up to consume an additional unit of the other good.

$$MRS_{xy} = \frac{\text{Quantity of goods sacrificed}}{\text{Quantity of goods obtained}} = \frac{\Delta Y}{\Delta X}$$

Combination	Good X	Good Y	MRS
A	1	8	
B	2	4	4Y:1X
C	3	2	2Y:1X

D	4	1	1Y:1X

MRS decreases with greater quantities of one good.

Assumptions of Indifference Curve

1. Two commodities

It is assumed that the consumer will spend his fixed amount of money on two goods, given constant prices of both the goods.

2. Ordinal Utility

The consumer can rank his preferences.

3.Non-satiety

The consumer always prefers more of both commodities, that is, he always tries to move towards a higher indifference curve to get higher satisfaction.

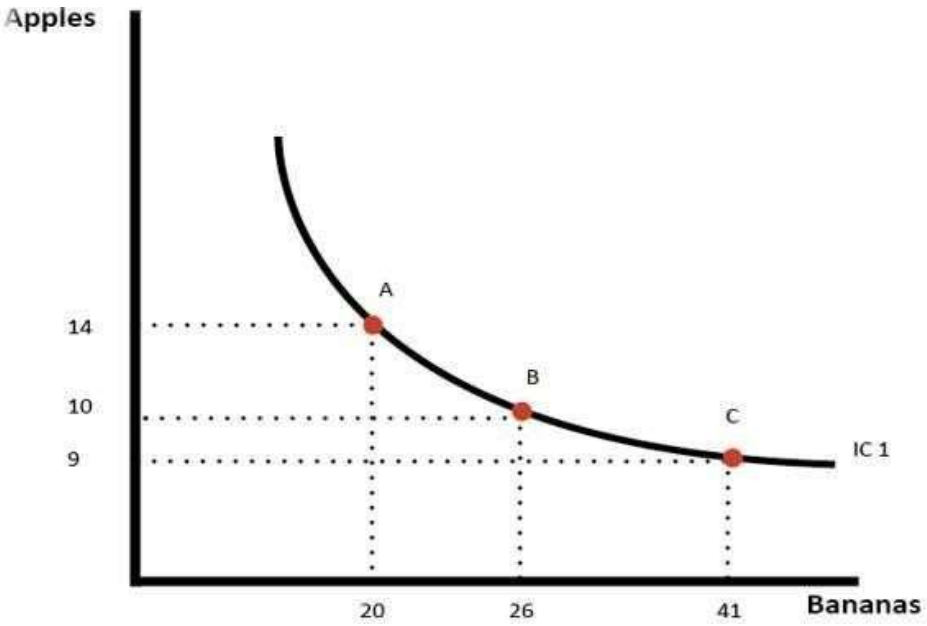
4. Diminishing MRS

Due to this assumption, the indifference curve is convex to the origin.

5.Rational consumer.

Properties of Indifference Curve

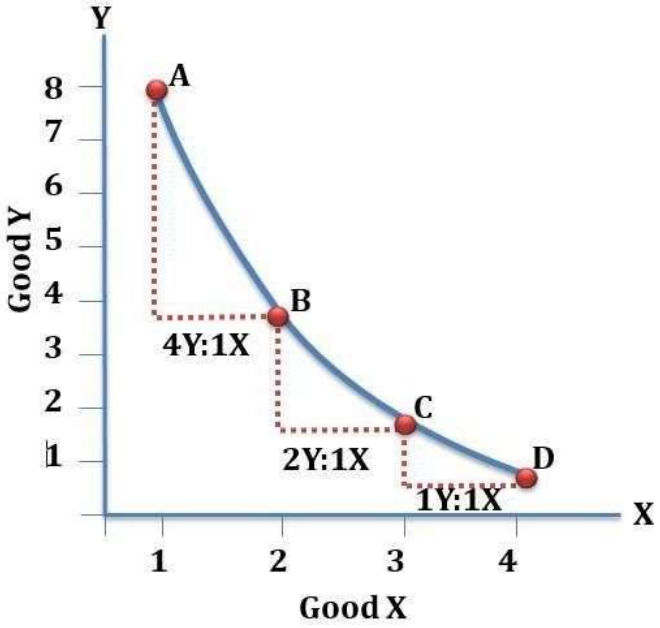
1. The indifference curve slopes downwards from left to right i.e. it is **negatively** sloped.
   This is because when consumer increases consumption of X, he must reduce consumption of Y to keep the utility level unchanged.



[IC doesn't touch either axis because the assumption of IC curve is that he consumes both the goods].

2. The indifference curve is strictly convex to the origin. This is because MRS declines as he moves downwards al along the indifference curve.

MRS_{xy} = slope of indifference curve

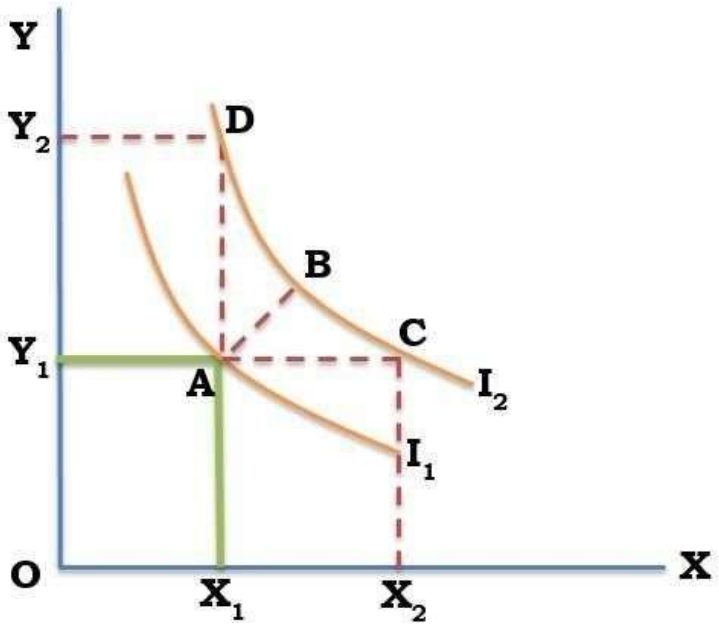


Combinations	Good X	Good Y	MRS
A	1	8	-
B	2	4	4Y:1X
C	3	2	2Y:1X
D	4	1	1Y:1X

- This rate keeps on decreasing due to law of diminishing marginal utility.
- He is willing to sacrifice less units of Y to obtain additional units of X. [Initially he is willing to sacrifice 4 units of X, then 2 units and so on].

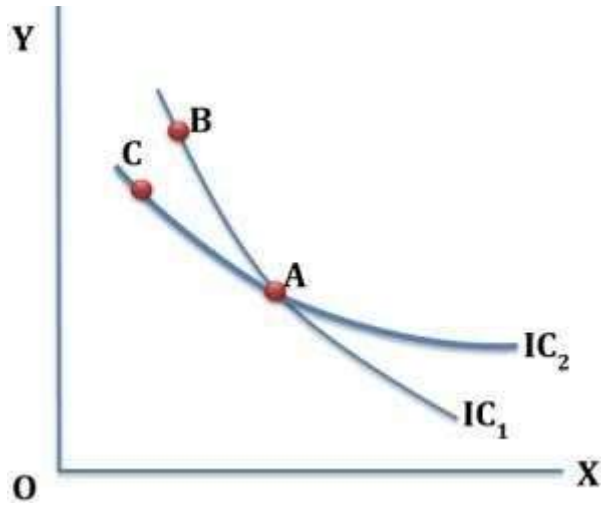
3. Higher Indifference Curve represents Higher Utility.

A set of indifference curves representing various levels of satisfaction is known as indifference map.



4. Indifference curve can never intersect each other.

As two indifference curves cannot represent the same level of satisfaction, they cannot intersect each other.



- Point A and B on IC_1 give the same level of satisfaction.
- Point A and C on IC_2 give the same level of satisfaction.
- However, B and C lie on different indifference curves and therefore cannot give the same level of satisfaction.
- Therefore, IC_1 and IC_2 can't intersect each other.

Budget Constraint

The consumer can buy combination of two goods within his income constraint i.e.

$P_x X + P_y . Y \leq M$

where, P_x and P_y are price of X and Y goods

X and Y are the amount of X and Y goods purchased

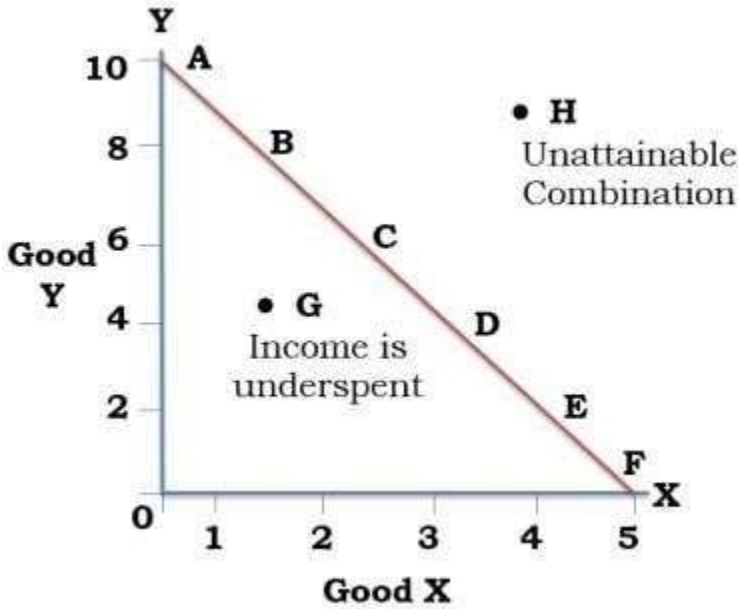
M – money income of the consumer.

Budget Line

Budget line is a **graphical** representation of all possible combination of two goods which can be purchased with given income and prices, such that the cost of each of these combinations is equal to the money income of consumer i.e.

$P_xX + P_yY = M$

It is also known as **price line.**



Slope of Budget Line

The **market rate of exchange** is the rate at which the two goods can be exchanged in the market or it is the rate at which the market requires sacrifice of one good to obtain extra unit of the other good.

Slope of budget line = Market Rate of Exchange (MRE)

Thus,

$$MRE = \frac{\text{Price of good obtained}}{\text{Price of good sacrificed}} = \frac{\Delta Y}{\Delta X}$$

$$MRE = P_x / P_y$$

- Price ratio is the price of the good on the horizontal or X-axis divided by the price of the good on the vertical or Y-axis.
- $\textbf{Price Ratio} = \frac{\text{Price of X } (P_X)}{\text{Price of Y } (P_Y)} = \frac{P_X}{P_Y}$

Properties of Budget Line

1. Budget line is downward sloping from left to right.
   The market requires consumer to sacrifice one good to obtain extra unit of the other good.
2. Budget line is downward sloping straight line.
   Slope of budget line is equal to MRE i.e. 'Price Ratio' of two goods which remains constant.

Consumer Equilibrium conditions:

Condition 1: MRS_{xy} = MRE = P_x / P_y (Necessary Condition)

CASE I : MRS_{xy} > P_x/P_y.

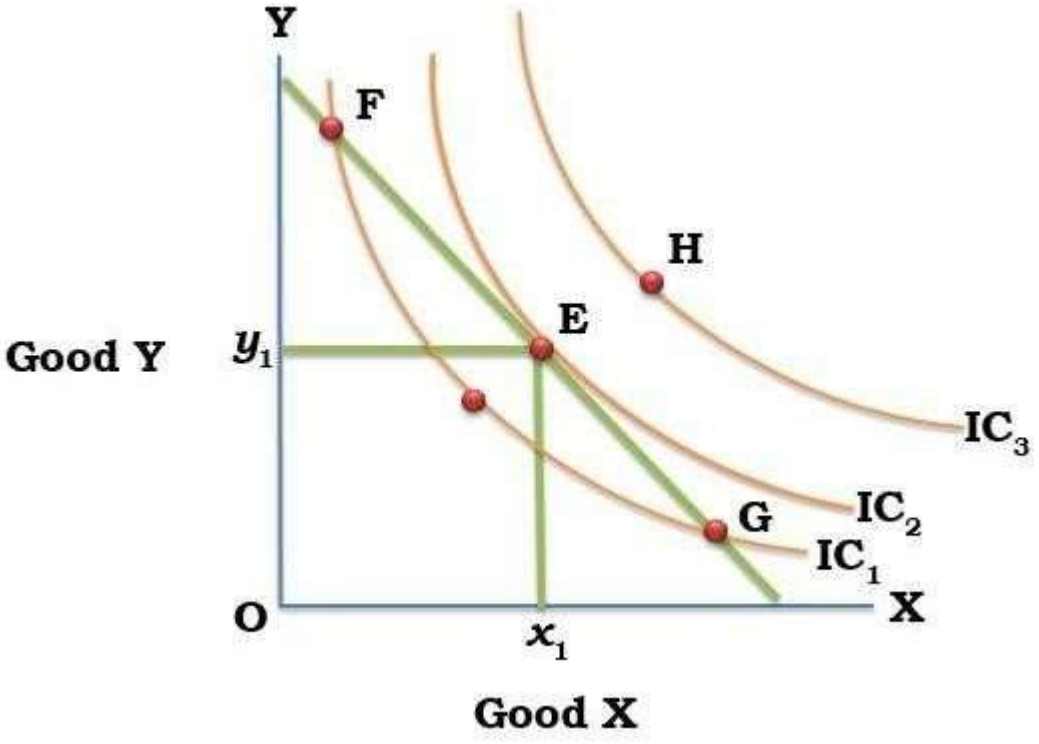
- The consumer is willing to pay more for X than the price prevailing in the market.
- Consumer will buy more of x.
- When he buys more of x, utility derived from X falls and he is willing to sacrifice less of Y.
- Thus MRS_{xy} starts declining.
- He continues to consume more of X, till MRS_{xy} = MRE = P_x/P_y.

CASE II: MRS_{xy} < P_x /P $_y$.

- The consumer is willing to pay less for X than the price prevailing in the market.
- It induces the consumer to buy less of X and more of Y.
- MRS_{xy} began to rise.
- He continues to decrease the consumption of X, till MRS_{xy} = P_x/P_y.

Condition 2: MRS_{xy} is Declining. (Sufficient Condition)

The indifference curve must be convex to the origin at the point of equilibrium. Unless MRS continuously falls, the equilibrium cannot be established.



"A consumer is in equilibrium at a point where budget line is tangent to indifference curve".

In the above diagram,

- Equilibrium is at point E, (Budget line touches the highest indifference curve IC_2) where the consumer purchases OX_1 quantity of commodity 'X' and OY_1 quantity of commodity 'Y'
- **MRS = Ratio of prices or P_x/P_y a**t tangency point E. The absolute values of the slope of the indifference curve and of the budget line are same.