UNIT THREE:
Theory of Consumer Behavoir (Utility Theory)

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Meaning of Utility

- The term utility refers to the human want satisfying power of the commodity.
- It is the subjective entity and can vary from person to person, time to time and

- Modern economists had criticized the concept of cardinal measurement of utility and argued that utility is psychological thing rather than quantitative thing; therefore utility can't be presented numerically but can be presented in order or can be ranked.
- By consuming two units of apple, we can't say that, I got ten utils of utility but can say that 1st unit of apple had more utility than 2nd unit of apple.
- Indifference curve analysis is the example of this approach. It was first used by F.Y.Edgeworth in 1881 AD.

Cardinal and Ordinal Utility approach

- Classical and neo-classical economists like *H.H.Gossen, A. Marshall, L. Walaras* etc. believed that utility is quantitative thing and can be measured numerically and its unit of measurement is *utils.*
- The initial contributor of the cardinal approach was H.H.Gossen, because he propounded the laws like law of diminishing marginal utility, law of substitution etc. in 1854 AD.
- Another main contributor of this approach was A. Marshall because he further popularized those laws as well as this cardinal measurement approach of utility.
- Cardinal approach is based on the assumptions like: rationality, numerical measurement of utility, budget constraint, constant marginal utility of money etc.

Differences between Cardinal and Ordinal Approaches

- The basic differences between cardinal and ordinal utility approaches are as follows;
  1. Measurement of utility
  2. Addition of utility
  3. Express the preference/Observation of preference
  4. Combination of goods
  5. Applicability of the approach
  6. Assumptions of the approach etc.

Types of Utility

- There are three types of utility :

1. Total utility (TU) :

Total satisfaction obtained by the consumer from consuming all the available units of the commodity is called total utility. It is the sum total of all the marginal utilities associated with each and every unit of consumption.

Mathematically,

$TU = \Sigma MU$

Or, $TU = MU_1 + MU_2 + MU_3 + \ldots\ldots\ldots\ldots + MU_n$

Where, TU = Total utility

MU_1= Marginal utility obtained from 1st unit of consumption.(so on…)

2. Average utility (AU) :

Utility per unit derived from consumption of given units of the commodity is called average utility. In other words it is the outcome of total utility divided by units of commodity consumed.

Mathematically,

$AU = TU/Q$

Where, TU = Total Utility ,

Q = Units of commodity.

3. Marginal utility (MU):

MU is the addition made to Total utility with consumption of one extra unit of the commodity. In other words, it is the ratio of change in total utility with the change in units of commodity (normally one).

Mathematically,

$MU = \Delta TU / \Delta Q$ Where, ΔTU = change in Total utility

ΔQ = change in units.

Alternatively,

$MU = TU_n - TU_{n-1}$ Where, TU_n= Total utility of n^{th} unit,

TU_{n-1}= Total utility of $n\text{-}1^{th}$ unit of consumption

Indifference Curve Analysis

BACKGROUND

- It is based on Ordinal utility approach.
- First used by F.Y.Edgeworth in 1881 AD, to show the possibility of exchange between products and factors between two persons efficiently.
- Irving Fisher also used the concept of ordinal utility approach in 1892 AD.
- V. Pareto explained his theory 'Pareto Optimality' by using this ordinal approach in 1906 AD.
- U. Slutsky also used this concept in 1915 AD.
- Formally, two economists J.R.Hicks and R.G.D.Allen developed the concept of Indifference Curve in 1934 AD.
- Again revised by Hicks in 1939 in his book "Value and Capital"

Meaning Of Indifference Curve

- Indifference curve is the locus of different combinations of two commodities X and Y, from which the consumer yields equal level of satisfaction.
- The consumer will be indifferent among all the combinations of that curve.
- Also called as iso-utility curve or equal satisfaction curve.

Assumptions of Indifference Curve

- Utility can't be presented numerically but can be presented in order.
- The consumer is rational .
- Two wants are satiable at a time.
- Total utility of consumer depends on the units of commodities.
- Consumer is consistent in his choice.
- Consumer's choice are characterized by transitivity. (if A>B, B>C then A>C)
- Consumer has non-satiety nature.
- The consumer has scale of preferences.
- There is operation of law of diminishing marginal rate of substitution.

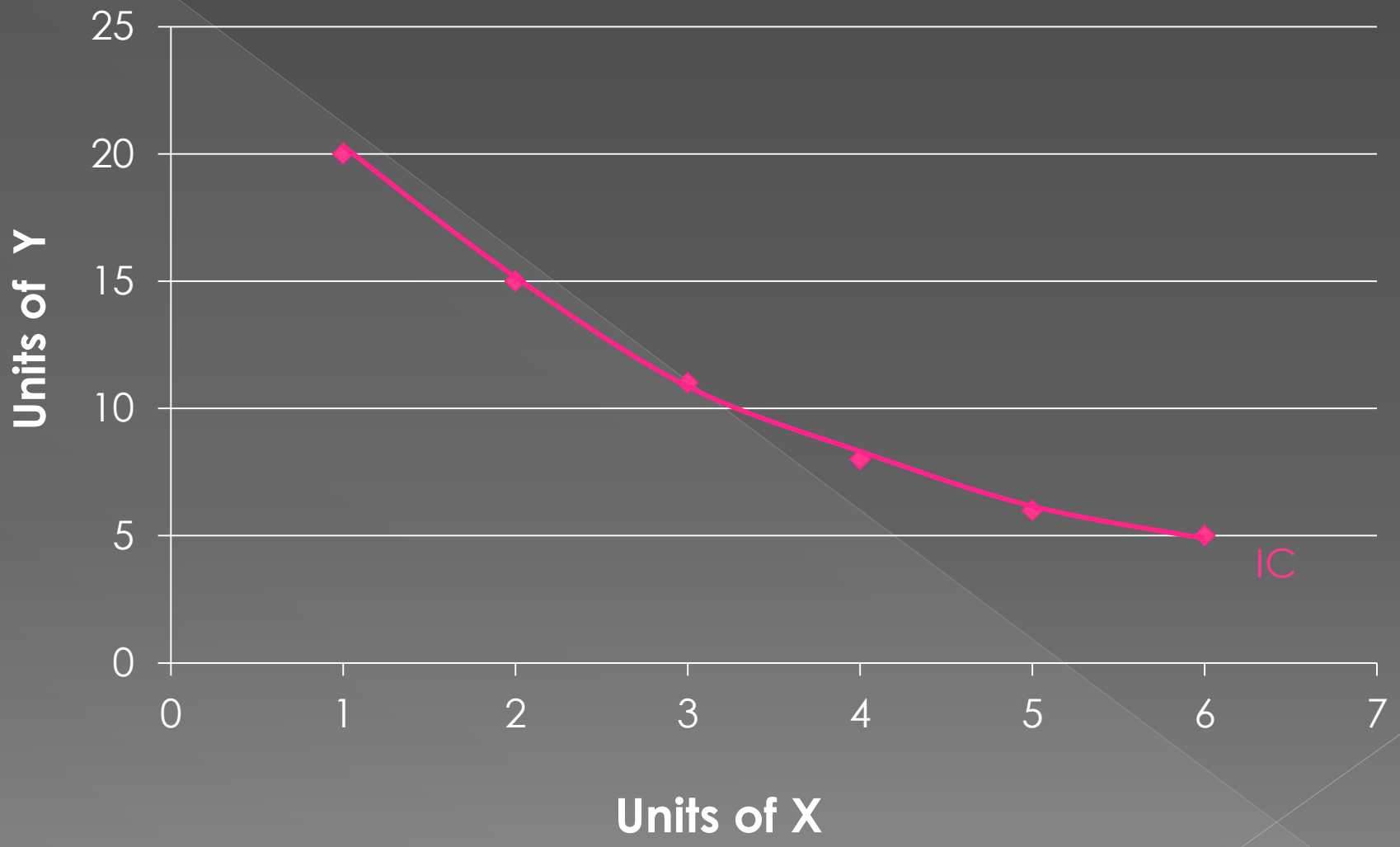
Derivation of IC

- IC can be derived by using Consumer's indifference schedule as following:
  - Consumer's indifference schedule can be defined as the tabular presentation of various combinations of two commodities which are equally acceptable to the consumer or which give equal level of satisfaction.
  - Prof. Watson, "*An indifference schedule is a list of combinations of two commodities, the list being so arranged that a consumer is indifferent to the combinations, preferring none of any others.*"

Consumer's Preference Schedule:

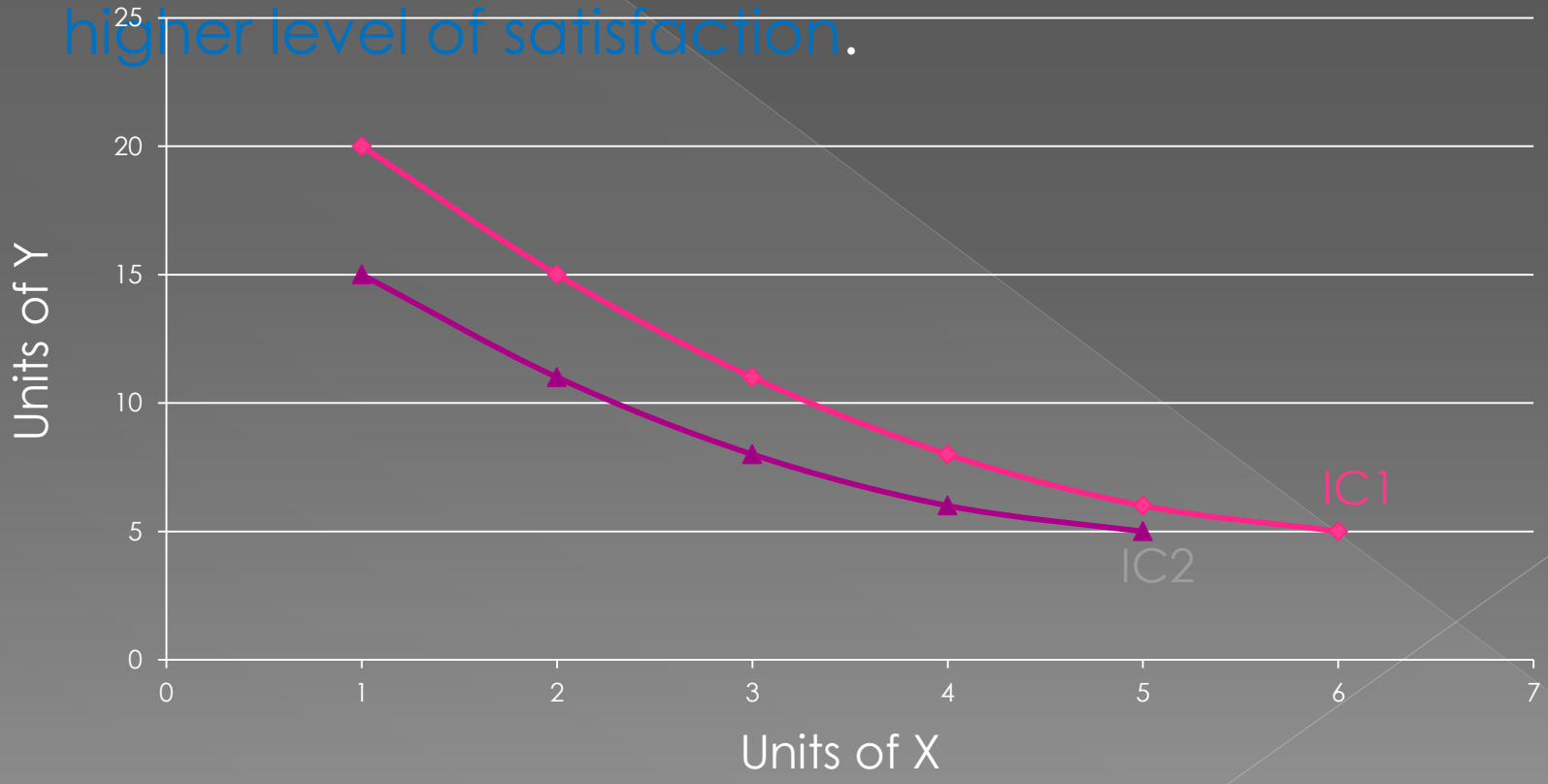
Combinations	Units of X	Units of Y	MRS_{XY}
A	1	20	-
B	2	15	5:1
C	3	11	4:1
D	4	8	3:1
E	5	6	2:1
F	6	5	1:1

Indifference Curve



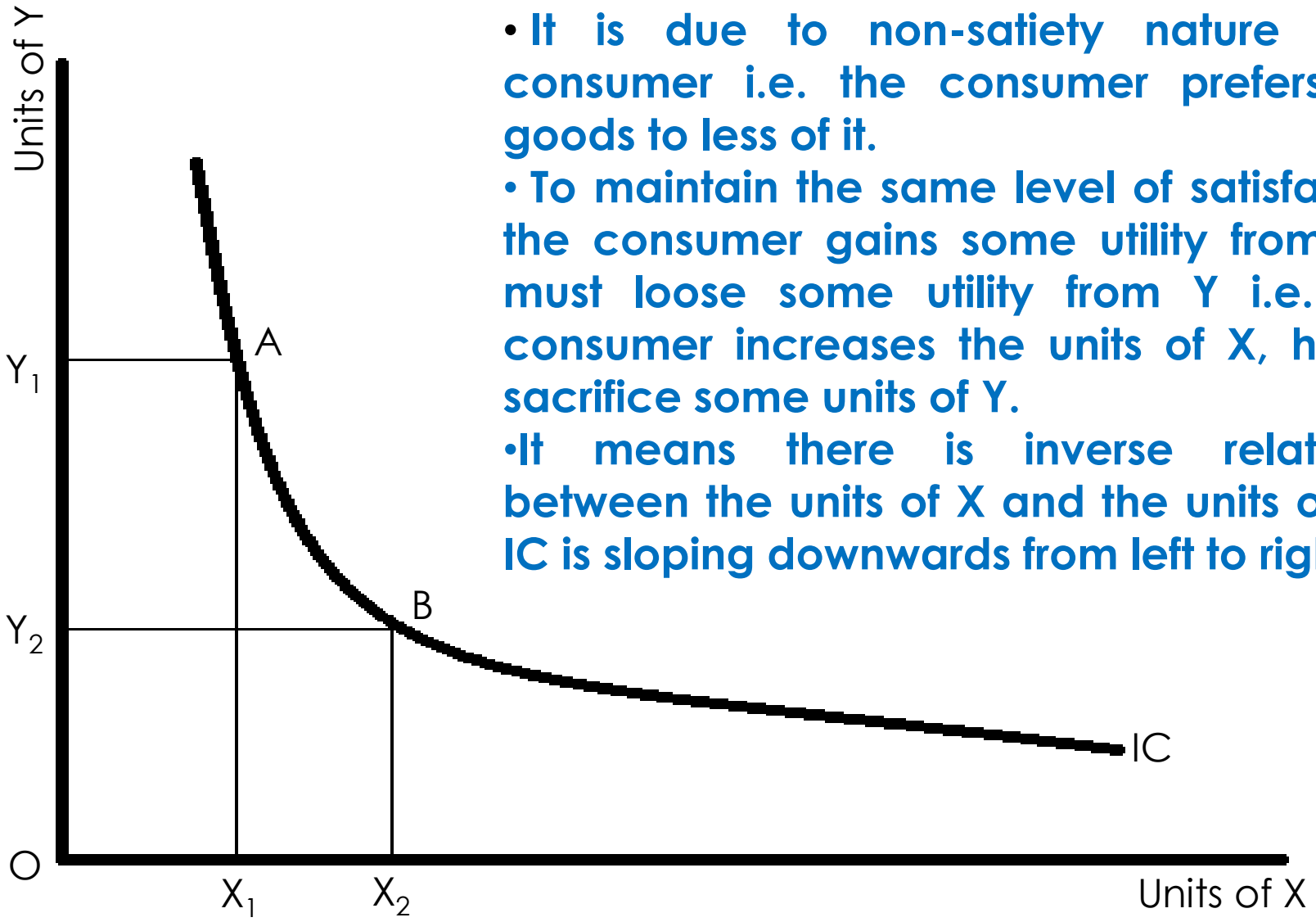
Indifference Map

- If two or more Indifference curves are presented in same graphical illustration it is called as indifference map. Indifference map describes all the combinations of consumer's preferences. In an indifference map higher indifference curve shows higher level of satisfaction.



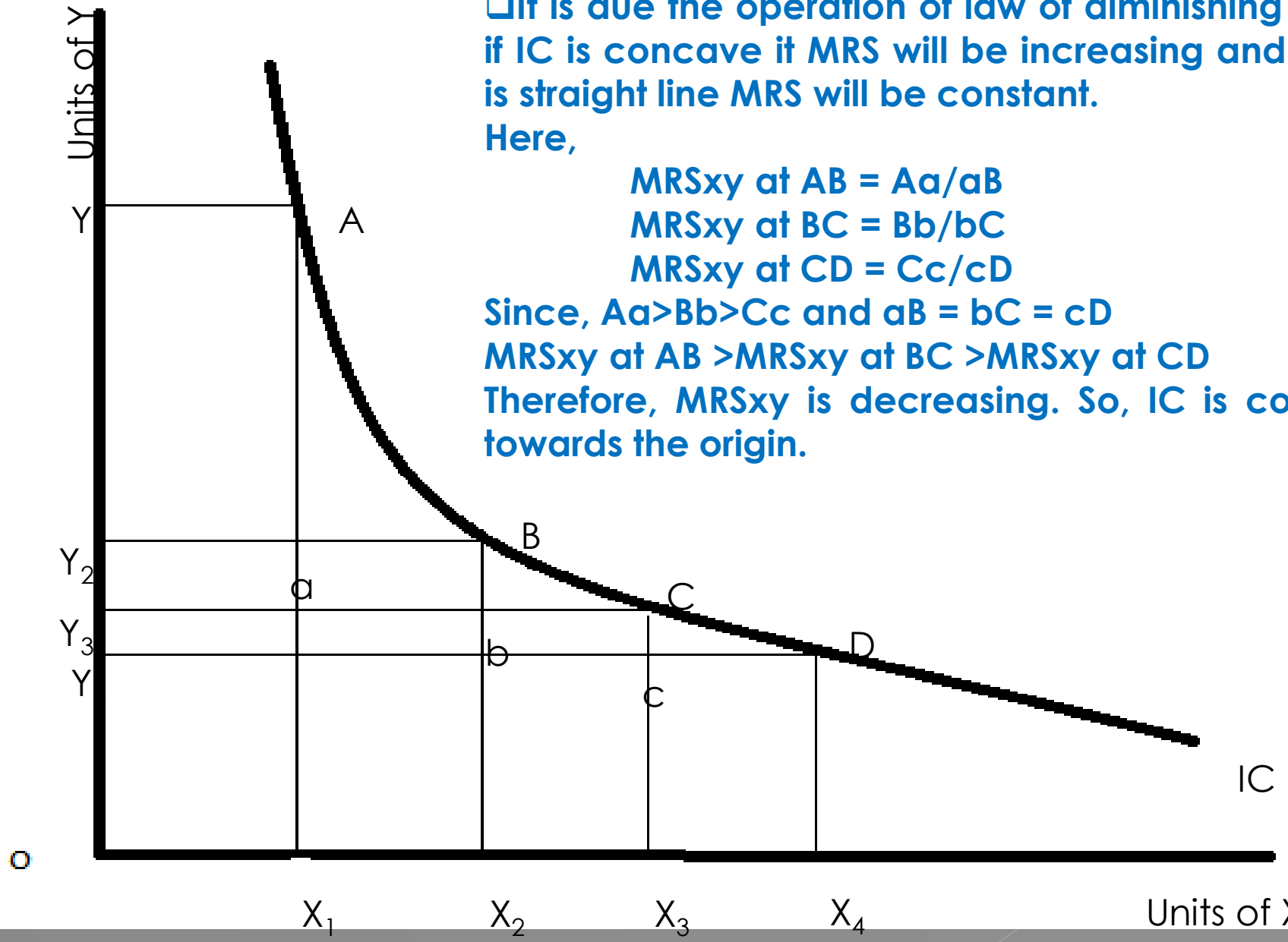
Properties of Indifference Curve

1) IC always slopes downwards from left to



- **It is due to non-satiety nature of the consumer i.e. the consumer prefers more goods to less of it.**
- **To maintain the same level of satisfaction if the consumer gains some utility from X, he must loose some utility from Y i.e. if the consumer increases the units of X, he must sacrifice some units of Y.**
- **It means there is inverse relationship between the units of X and the units of Y. so, IC is sloping downwards from left to right.**

2) IC is convex towards the origin



- It is due the operation of law of diminishing MRS, if IC is concave it MRS will be increasing and if, IC is straight line MRS will be constant.

Here,

MRSxy at AB = Aa/aB

MRSxy at BC = Bb/bC

MRSxy at CD = Cc/cD

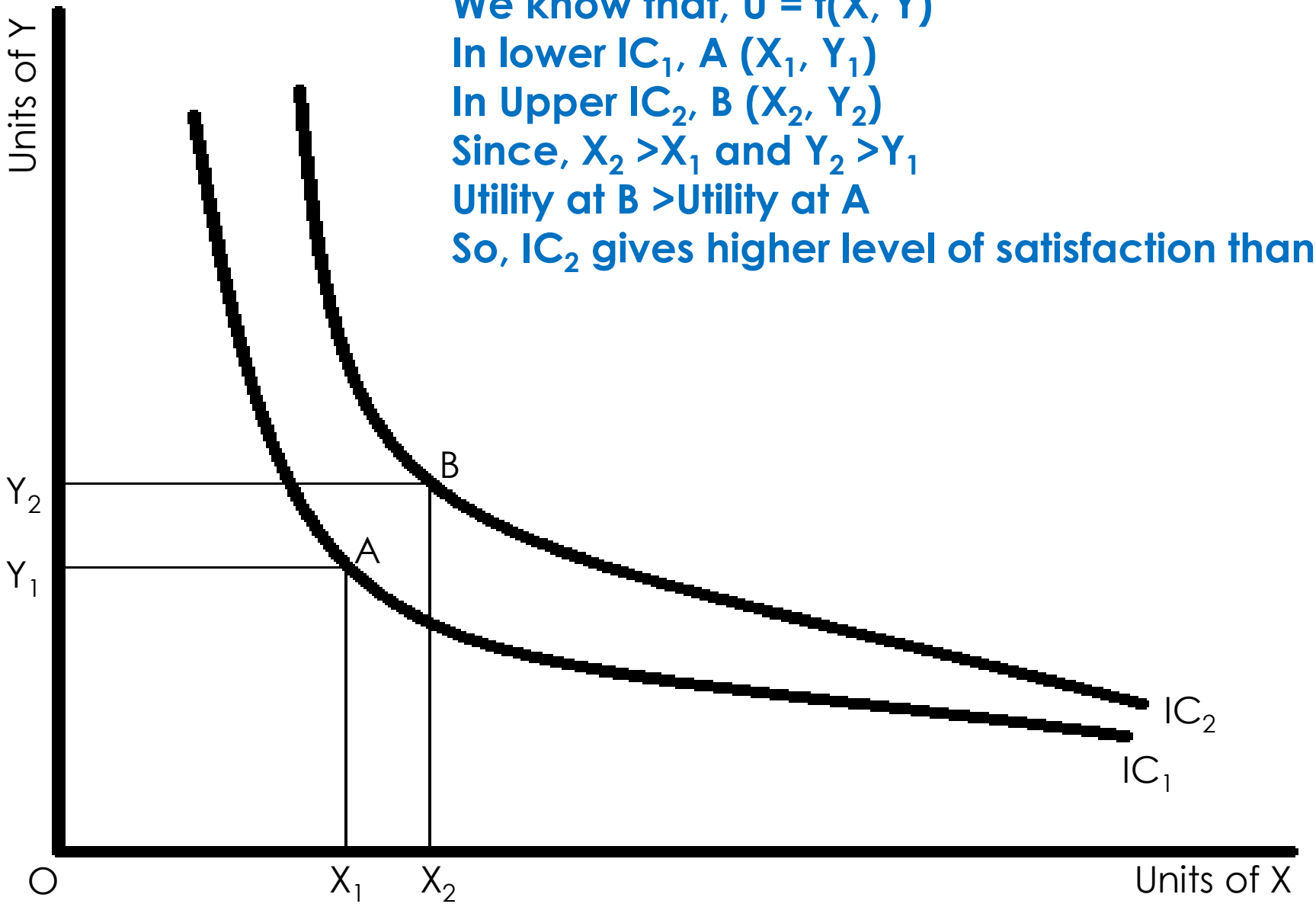
Since, Aa>Bb>Cc and aB = bC = cD

MRSxy at AB >MRSxy at BC >MRSxy at CD

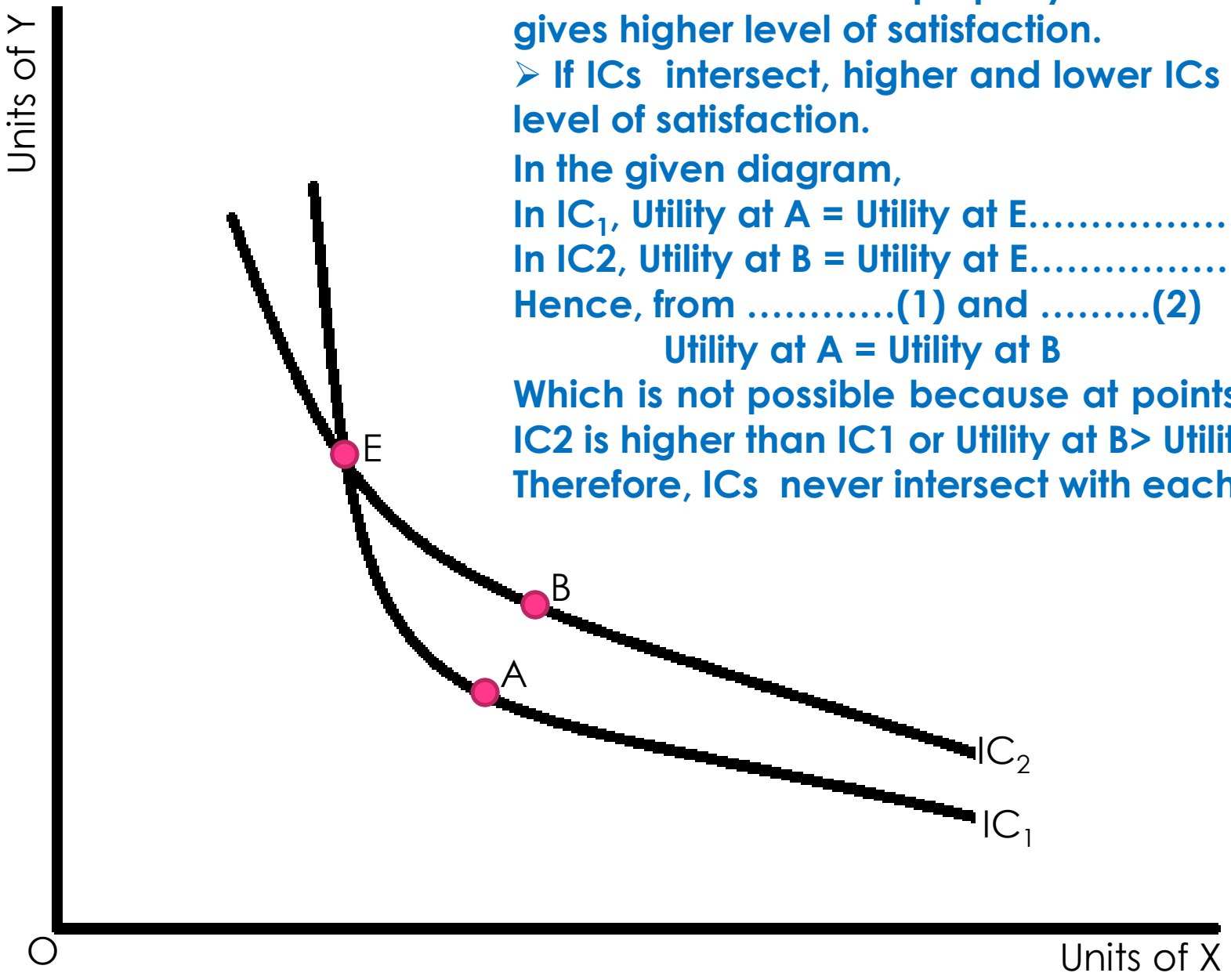
Therefore, MRSxy is decreasing. So, IC is convex towards the origin.

3) Higher IC yields higher level of satisfaction

We know that, U = f(X, Y)
In lower IC_1, A (X_1, Y_1)
In Upper IC_2, B (X_2, Y_2)
Since, $X_2 > X_1$ and $Y_2 > Y_1$
Utility at B >Utility at A
So, IC_2 gives higher level of satisfaction than IC_1



4) ICs Never Intersect with Each other



- It is due to the 3rd property of IC i.e. higher IC gives higher level of satisfaction.
- If ICs intersect, higher and lower ICs give same level of satisfaction.

In the given diagram,

In IC_1, Utility at A = Utility at E.....(1)

In IC2, Utility at B = Utility at E.....(2)

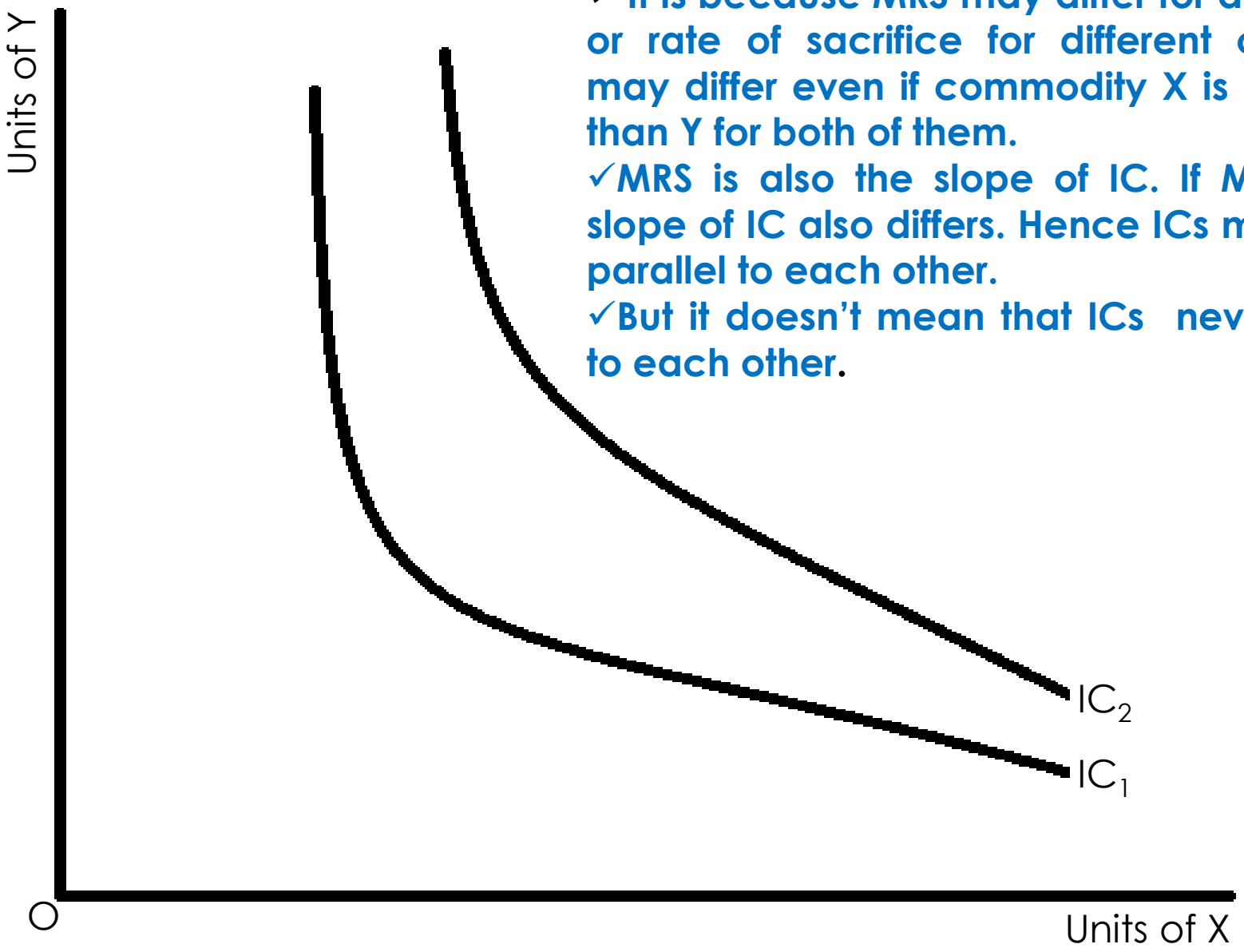
Hence, from .....(1) and .....(2)

Utility at A = Utility at B

Which is not possible because at points A and B, IC2 is higher than IC1 or Utility at B> Utility at A

Therefore, ICs never intersect with each other.

5) ICs need not to be parallel with each other.



✓ It is because MRS may differ for different ICs or rate of sacrifice for different consumers may differ even if commodity X is preferable than Y for both of them.

✓MRS is also the slope of IC. If MRS differs, slope of IC also differs. Hence ICs may not be parallel to each other.

✓But it doesn't mean that ICs never parallel to each other.

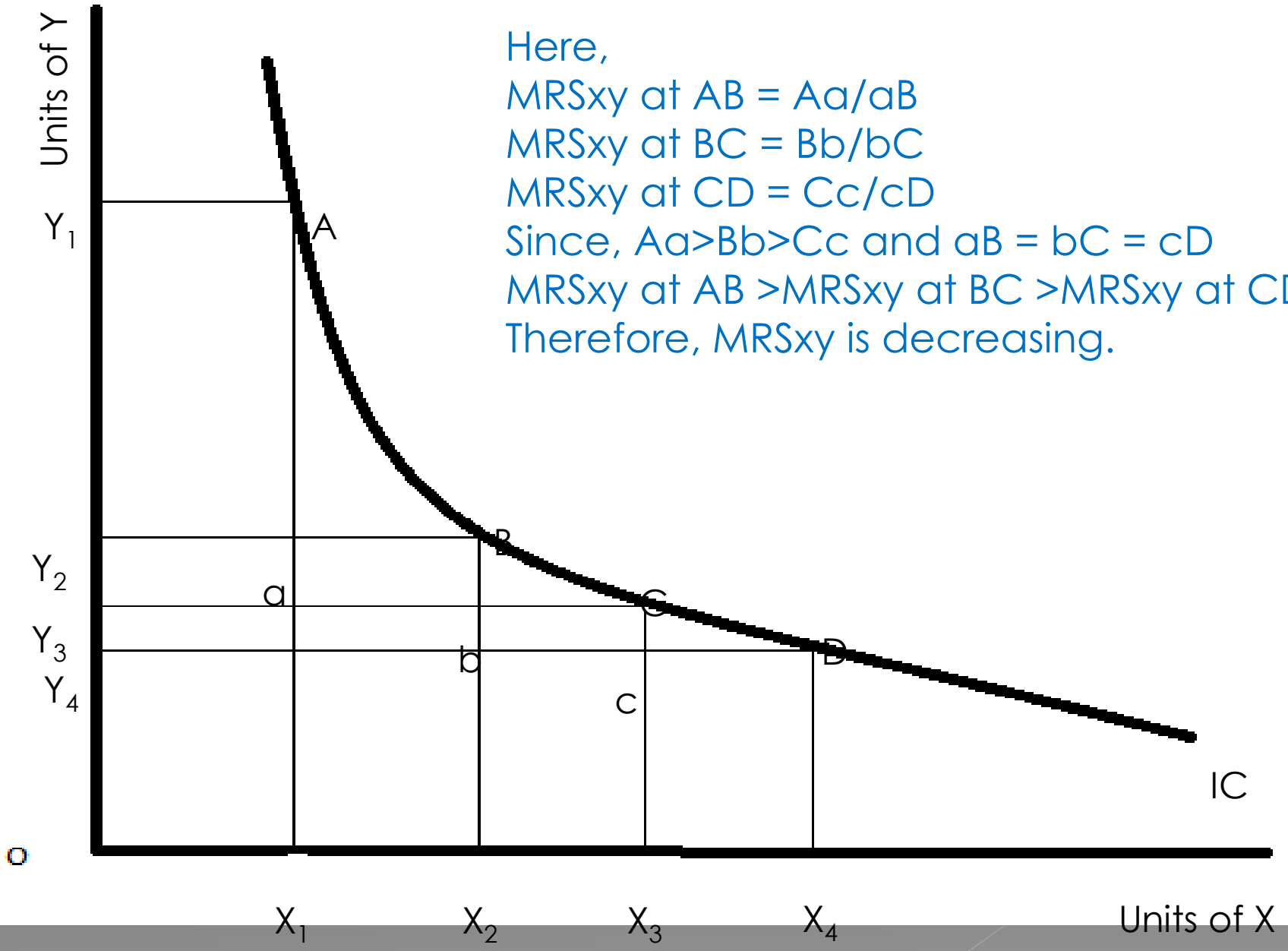
The law of diminishing MRS

- Concept of MRS:

  MRS can be defined as the units of a commodity which must be sacrificed to increase one extra unit of the commodity so that the level of satisfaction or utility remains constant. MRS_{XY} represents the amount of Y which the consumer is ready to sacrifice for the gain of one additional unit of X. so that, his level of satisfaction remains same. In other words, MRS_{XY} is the ratio of change in units of Y goods with the change in units of X goods. It is also the slope of the Indifference curve.

- Let the consumer only consumes two commodities X and Y, in which X is preferable than Y, so the consumer will increase the units of X by sacrificing the units of Y.
- Total utility of consumer depends on the units of X and Y
  - $U = f(X,Y)$
- If the consumer increases the units of X by ΔX, with marginal utility MU_X , gain in total utility by the consumer is , $\Delta X. MUx$……(1)
- For this the consumer will sacrifice the units of Y, if the sacrificed units of Y is ΔY, with marginal utility MUy, loss in total utility by the consumer is , $- \Delta Y. MUy$
- In that process the consumers utility remains unchanged ,
  - i.e . Total utility gain = total utility loss
    - $\Delta X. MUx = - \Delta Y. MUy$
    - $- \Delta Y/ \Delta X = MUx/MUy$
    - $MRS_{XY} = - MU_X/MU_Y$

Graphically,



Here,
MRSxy at AB = Aa/aB
MRSxy at BC = Bb/bC
MRSxy at CD = Cc/cD
Since, Aa>Bb>Cc and aB = bC = cD
MRSxy at AB >MRSxy at BC >MRSxy at CD
Therefore, MRSxy is decreasing.

Causes of Law of Diminishing MRS

- The want for a particular good is satiable at a time (when a consumer has more and more of a good, the intensity of his want for that good goes on declining.)

- Goods can't be perfectly substitutable.

  (if two goods are perfectly substitutable MRS remains constant and equal to one.)

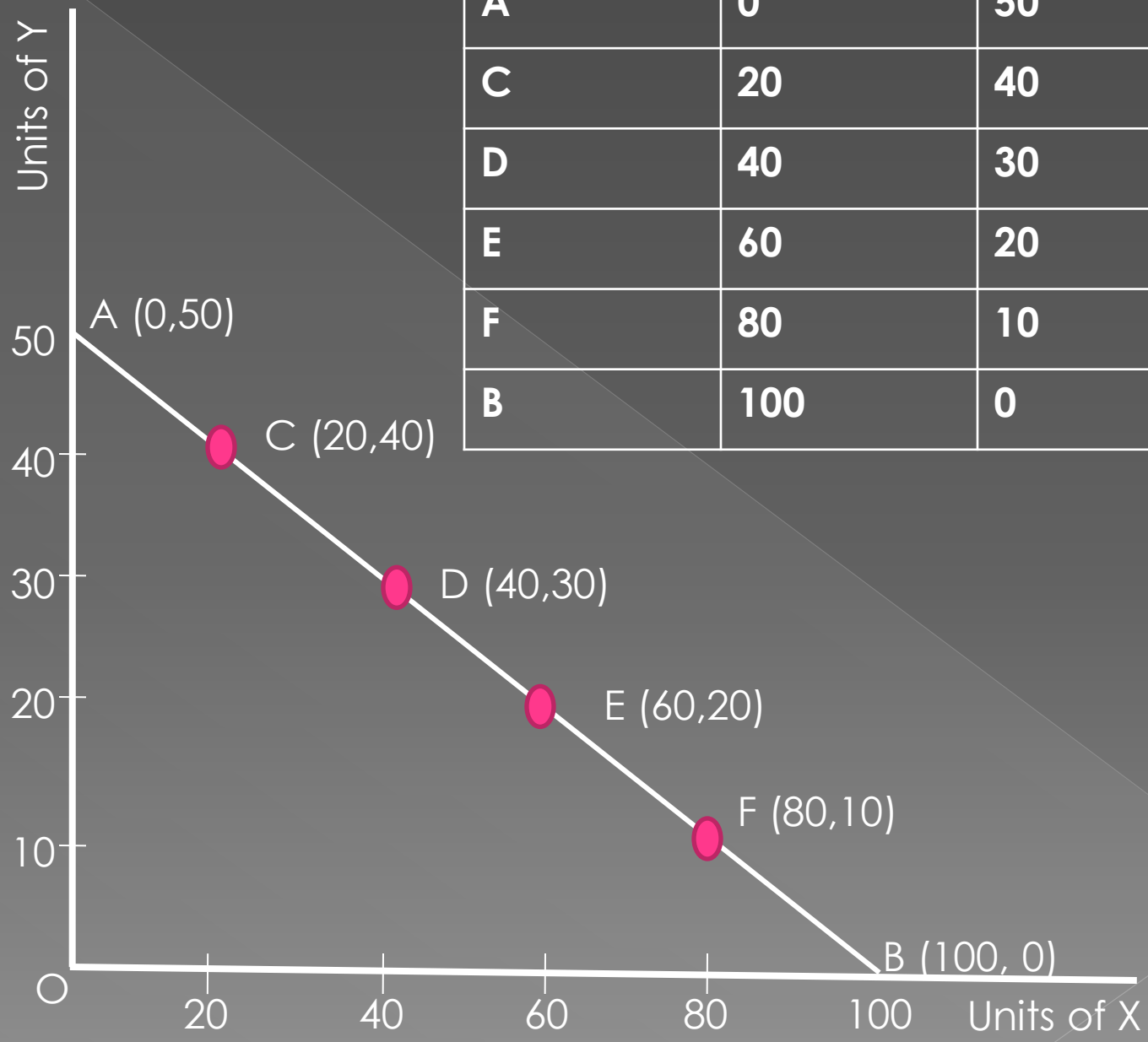
- Increase in quantity of good does not increase the want satisfying power of the other.

Budget line /Price Line:

- Budget line is also a locus of different combinations of two commodities X and Y which yields equal expenditure of the consumer or which can be purchased by using the fixed income/budget of the consumer.
- In two commodity model, budget constraint of the consumer can be expressed as,
  - $P_x .X + P_y .Y = B$
- Let, B = Rs1000, Px = 10, Py = 20
  - Then , X = 0, Y = 1000/20 = 50
  - When , Y = 0 , X = 1000/10 = 100
- The combinations of X and Y are A(0,50) and B(100,0)
- By Plotting those points in X-axis and Y-axis we get a straight line joining two axes, which is called as price line/budget line. Which shows equal money expenditure of the consumer.

Graphically,

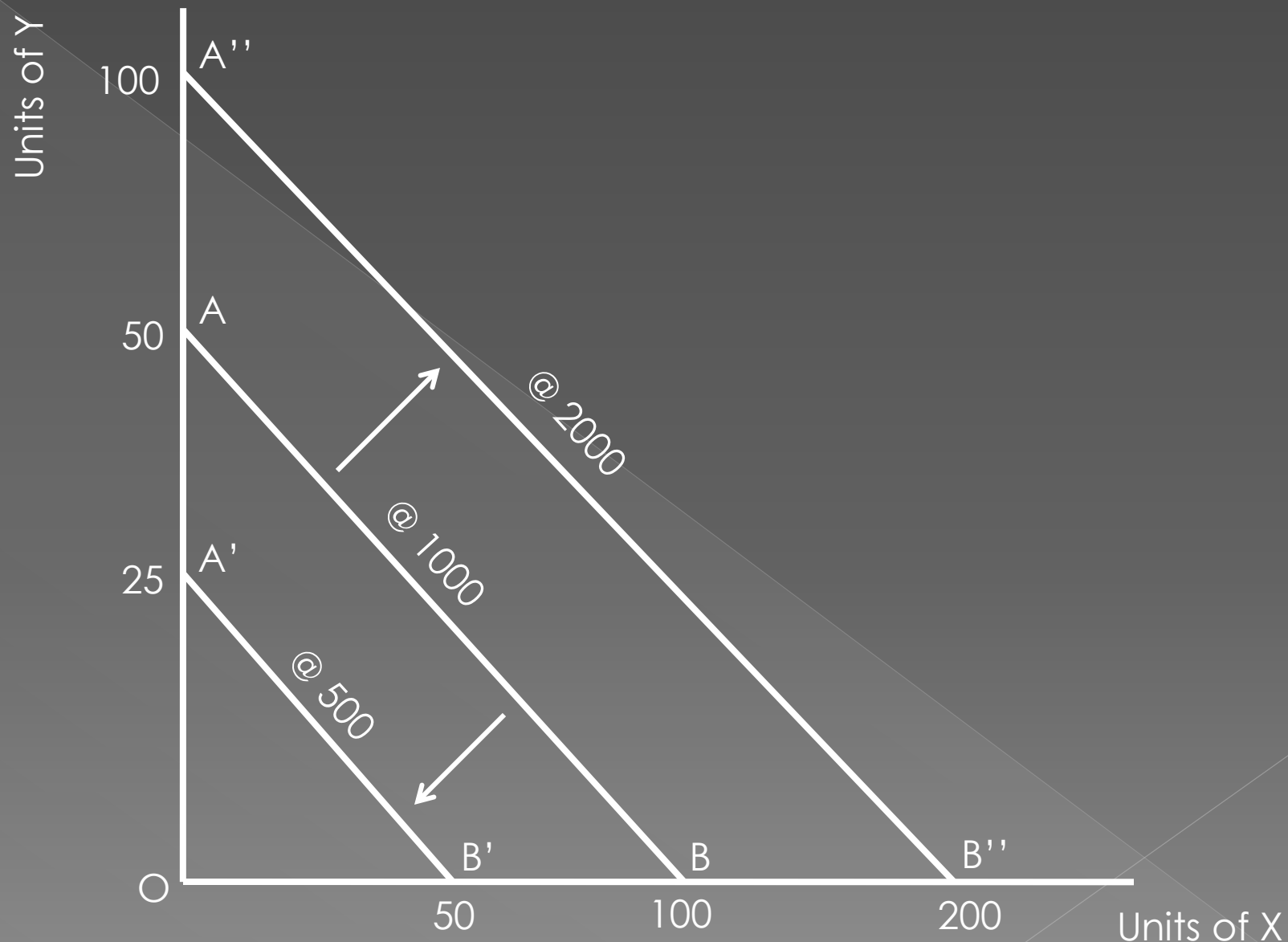
Combination	Units of X @ 10 /unit	Units of Y @20/unit	Expenditure
A	0	50	1000
C	20	40	1000
D	40	30	1000
E	60	20	1000
F	80	10	1000
B	100	0	1000



Shift of Budget Line:

- Budget line shifts due to the following two reasons:
- A) Due to change in total budget of the consumer.
- In this case budget line shifts parallelly from its original position. If consumer's budget increases budget line shifts upwards and if budget decreases budget line shifts downwards.
- As for example, in the above case if consumer's budget increases to 2000, then …….
- If Budget reduces to 500, then…….

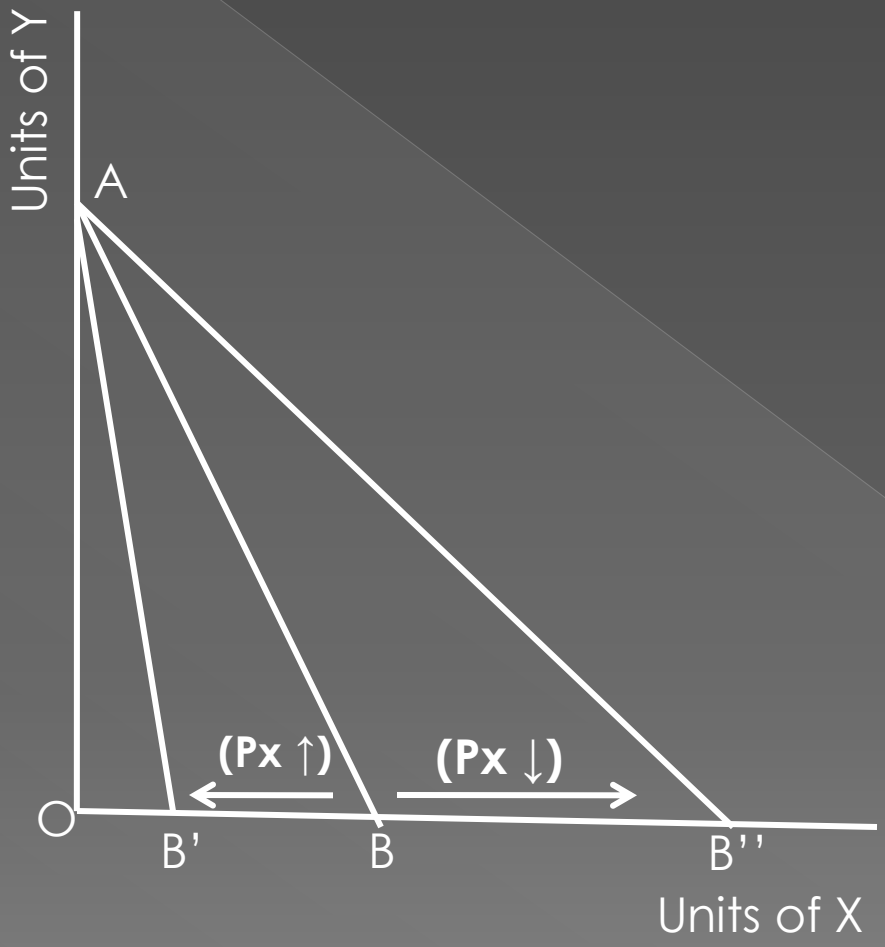
Graphically,



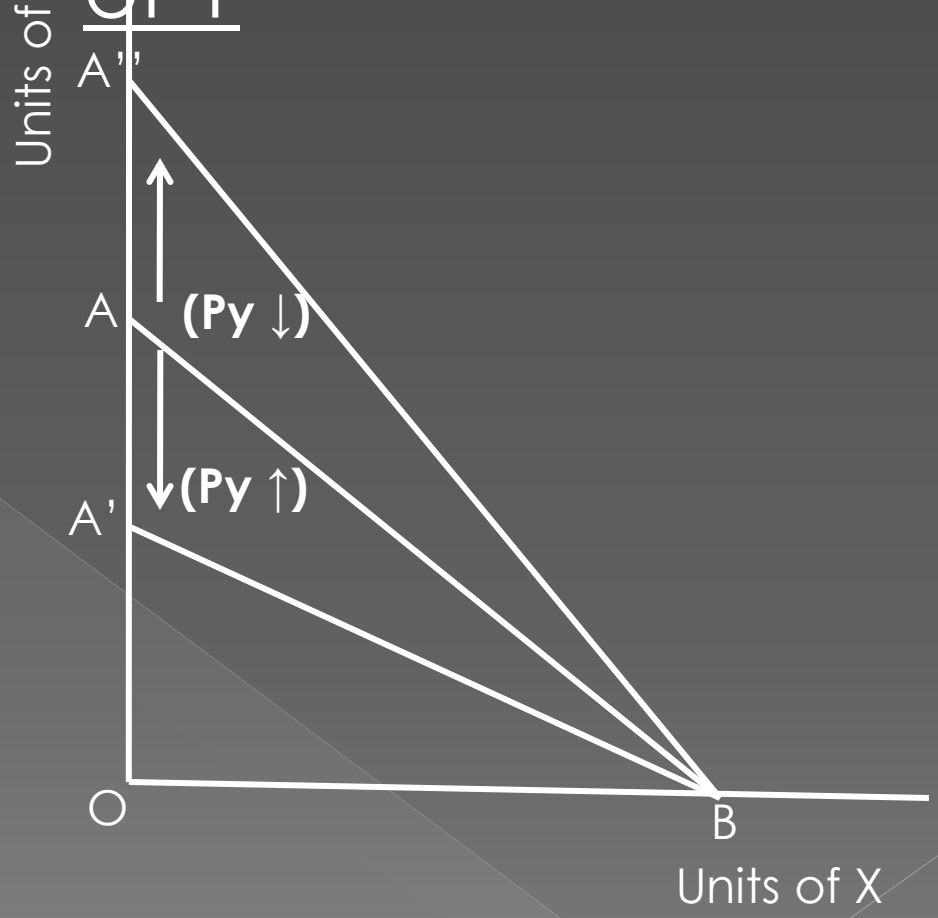
B) Due to change in Price of commodities

- When price of commodities change, budget line will swing only in that axis in which the price changed commodity is expressed. If price of commodity increases, budget line will swing towards the origin and if price of commodity decreases budget line will swing away from origin.

a) Change in Price of X



b) Change in Price of Y



Consumer's Equilibrium:

- The word equilibrium was derived from the mathematical word 'Statics' which means 'Science of Rest'.
- Formally it was coined from latin words '*Equi*' and '*Libra*' which means balancing the two sides of Libra.
- Equilibrium can also be defined as the state/point of rest or stability situation. If anyone achieves it, s/he don't want to change it to get any other situation.
- G.J. Stigler, "*An equilibrium is a position from which there is no tendency to move*".
- Tibor Sitovosky, "*A market or an economy or any groups and firms is in equilibrium when none of its members feels impelled to change his behavior.*"
- The producer will be in equilibrium when s/he gets highest level of profit from his production system.

- The consumer will be in equilibrium when s/he gets maximum satisfaction from consumption of goods and services.
- The rational consumer always tries to get highest level of satisfaction from consumption of maximum goods and services from his given limited budget.
- As we know, indifference map shows various preference levels of the consumer, where higher IC shows higher level of satisfaction.
- Hence, a rational consumer tries to achieve higher IC.
- Family of Budget line shows various budget expenditures of the consumer, where lower budget line shows less expenditure of the consumer.
- Hence, a rational consumer always tries to achieve lower budget line.
- The consumer will be in equilibrium when he maximizes the utility subject to the minimum limited budget.

Assumptions

- The consumer must be rational.
- The money income of the consumer is fixed and constant.
- He spends all his income in two goods X and Y.
- Prices of two goods remains unchanged.
- The goods are homogeneous and divisible.
- The taste and preference of consumer is given and constant.
- The consumer acts rationally and spends income so as to maximize the satisfaction.
- The consumer has given budget line and indifference map.

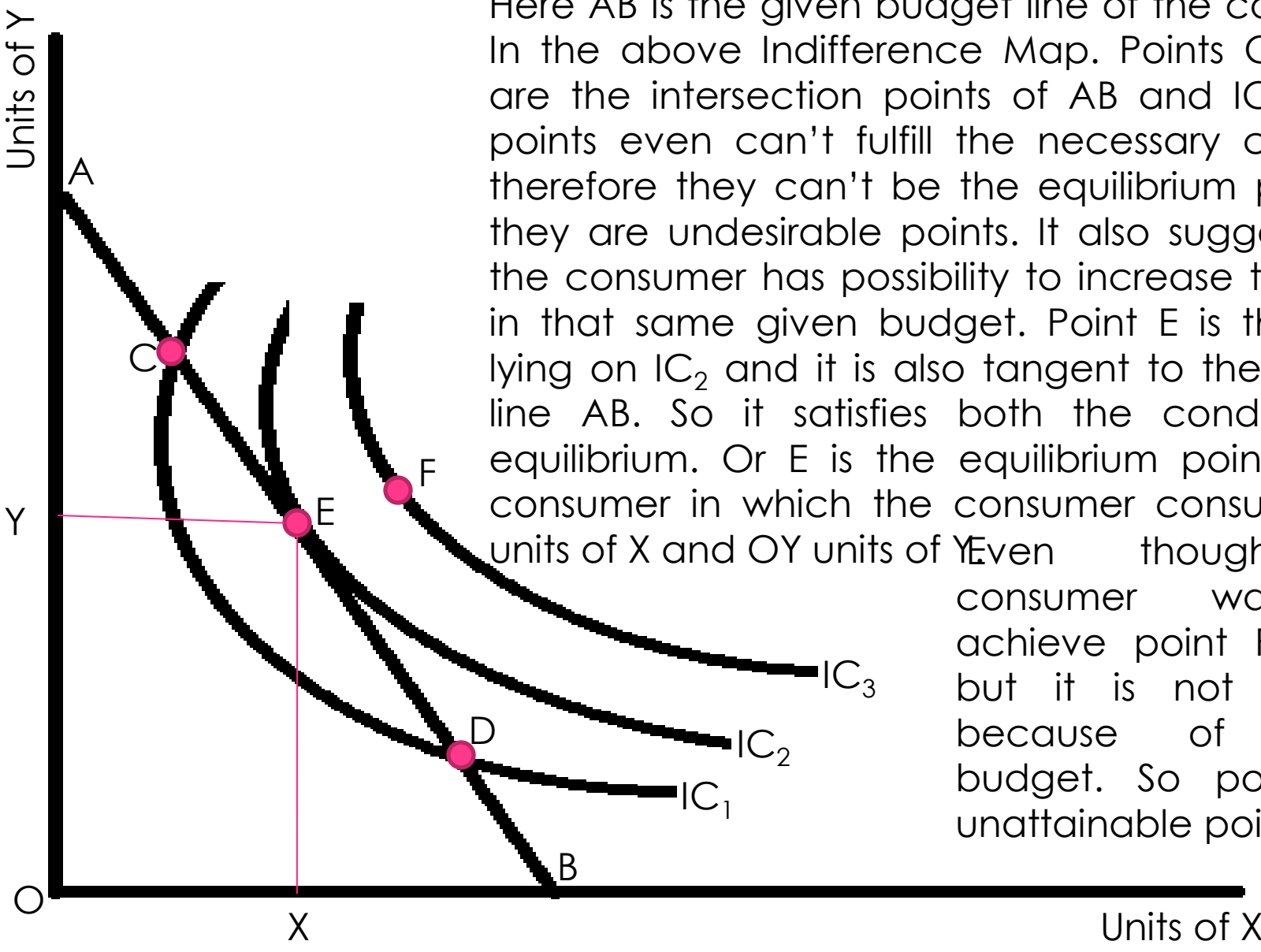
Conditions for equilibrium:

- **Necessary condition (First order condition)**: *Budget line must be tangent to the indifference curve. i.e. Slope of IC should be equal to the slope of budget line.*

$$MRS_{XY} = \frac{P_X}{P_Y}$$

- **Sufficient Condition (Second Order Condition):** Indifference curve should be convex to the origin. i.e. MRS should be diminishing at the equilibrium point.

Graphically,



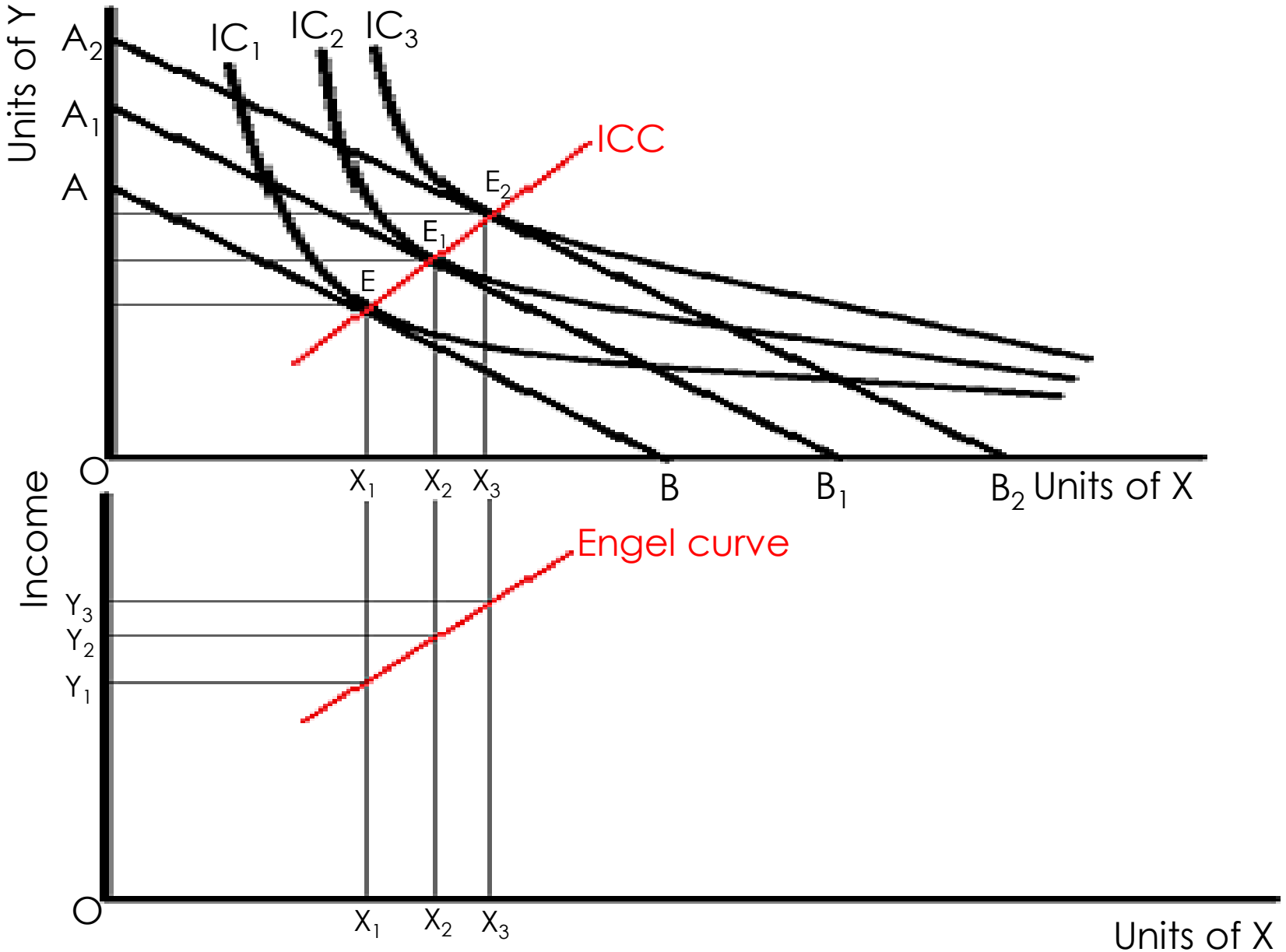
Here AB is the given budget line of the consumer. In the above Indifference Map. Points C and D are the intersection points of AB and IC_1, these points even can't fulfill the necessary condition therefore they can't be the equilibrium points or they are undesirable points. It also suggests that the consumer has possibility to increase the utility in that same given budget. Point E is the point lying on IC_2 and it is also tangent to the budget line AB. So it satisfies both the conditions of equilibrium. Or E is the equilibrium point of the consumer in which the consumer consumes OX units of X and OY units of Y. Even though the consumer want to achieve point F of IC_3 but it is not possible because of limited budget. So point F is unattainable point.

Income effect and Derivation of Engel Curve

- We know that, change in income leads to change in quantity demanded of commodities which also changes the equilibrium point of the consumer. The shift of consumer's equilibrium point due to change in income is called income effect.
- German statistician and economist **Ernst Engel** derived the graphical relationship between money income and money expenditure on a particular good. Which is called as Engel's curve.
- Edwin Mansfield, "*An Engel curve is the relationship between the equilibrium quantity purchased of a good and the level of income.*"
- Engel curve is derived from income consumption curve (ICC).where ICC is a curve derived from joining different equilibrium points of Income effect.
- Engel curve is useful to make study of the expenditure pattern of households towards a commodity.

- Income effect may change according to the type of commodities as following:
- **Positive Income effect**:
- other things remaining constant if consumption of commodity increases with increase in income and vice versa, it is called as positive income effect. It is the case of normal goods.
- In case of normal goods, income elasticity of demand is positive and Engel curve is also positively sloped.

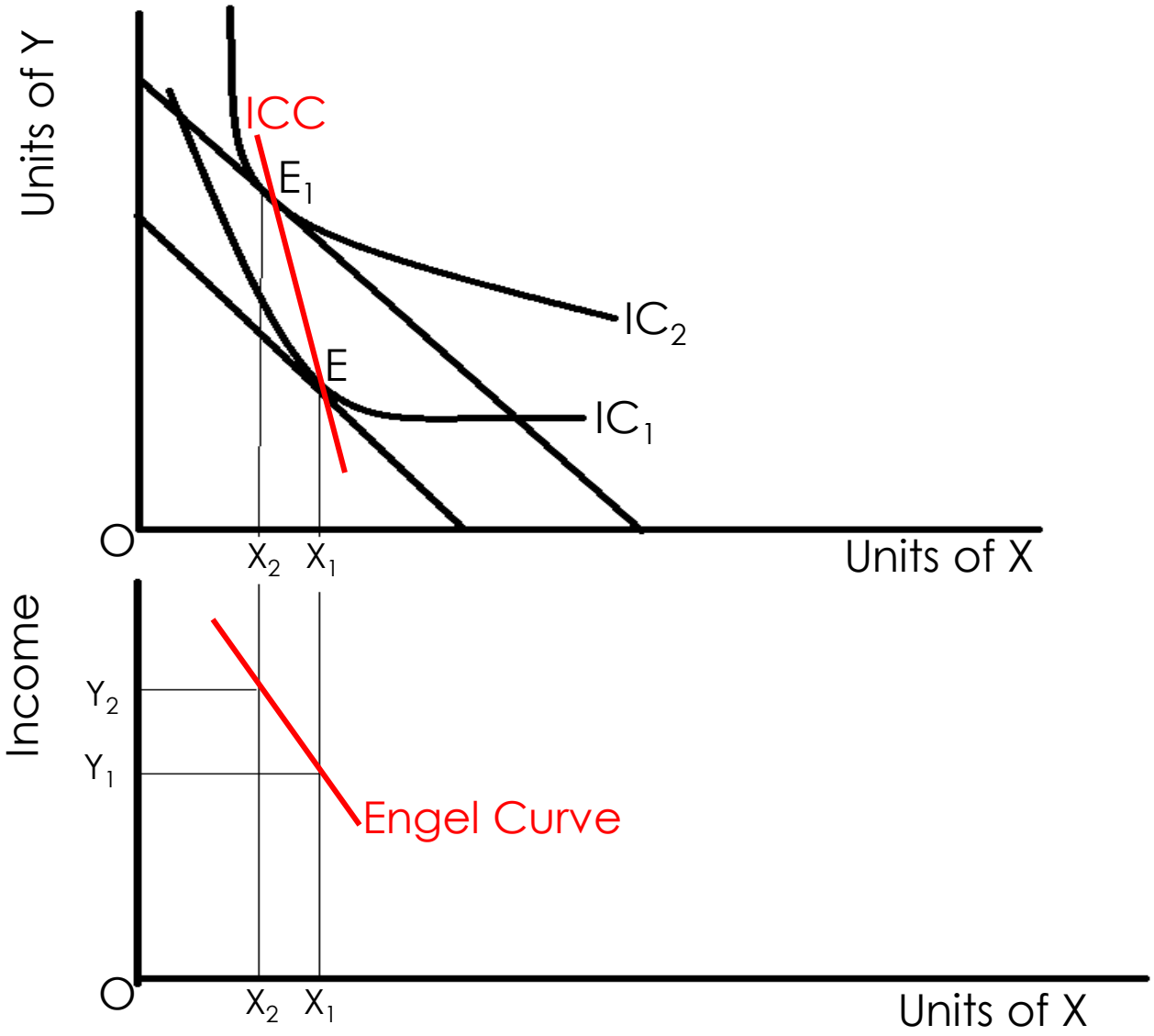
Graphically



Negative Income effect:

- Other things remaining constant if increase in income of the consumer reduces the consumption of commodity it is called as negative income effect. Income effect is negative in case of inferior goods.
- In case of inferior goods, income elasticity of demand is negative and Engel's curve is also negatively sloped.

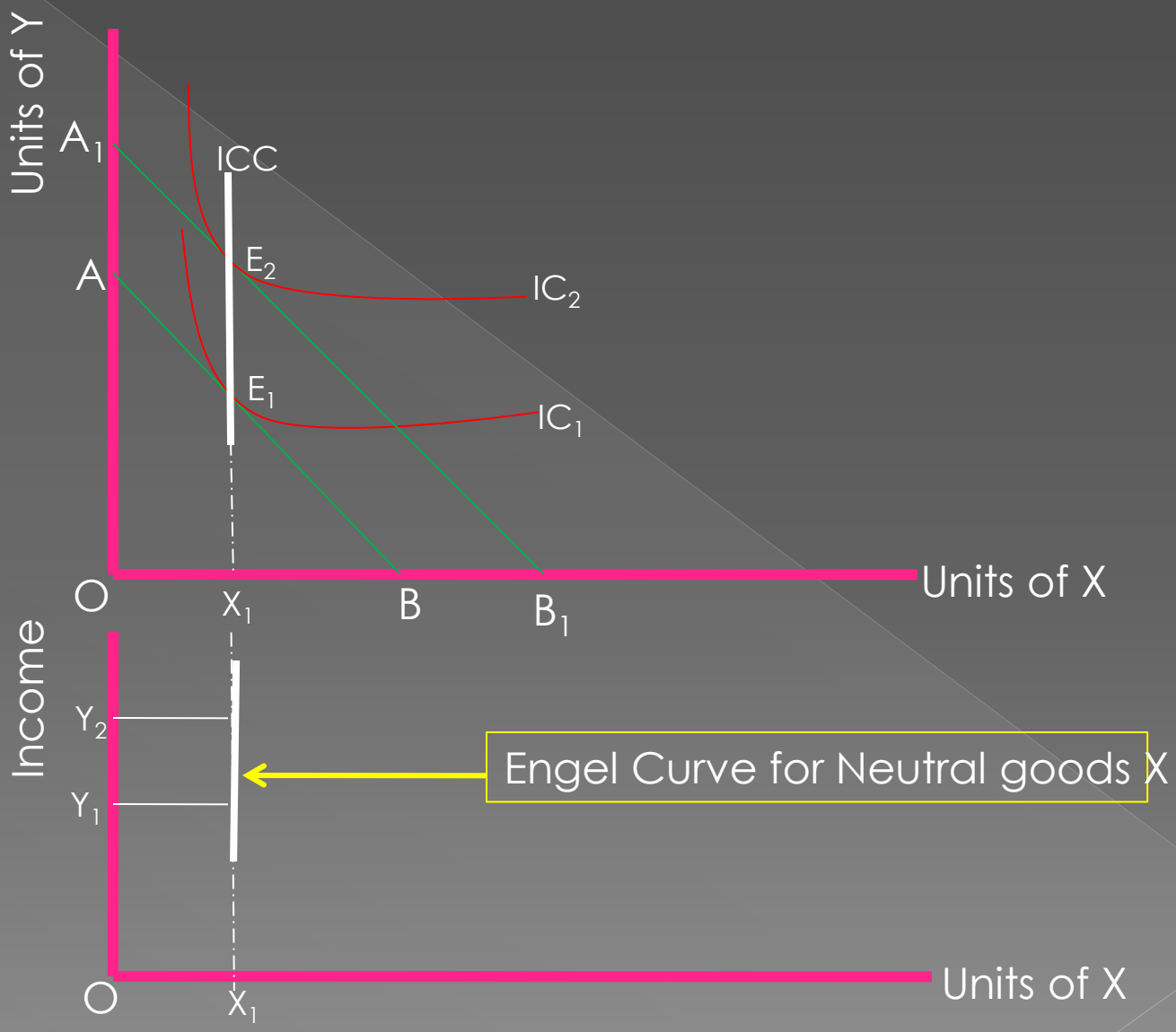
Graphically,



Zero Income effect:

- Other things remaining constant if increase/decrease in income of the consumer has no effect on consumption of commodity it is called as zero income effect. Income effect is zero in case of Neutral goods.
- In case of neutral goods, income elasticity of demand is zero and Engel's curve is parallel to y-axis.

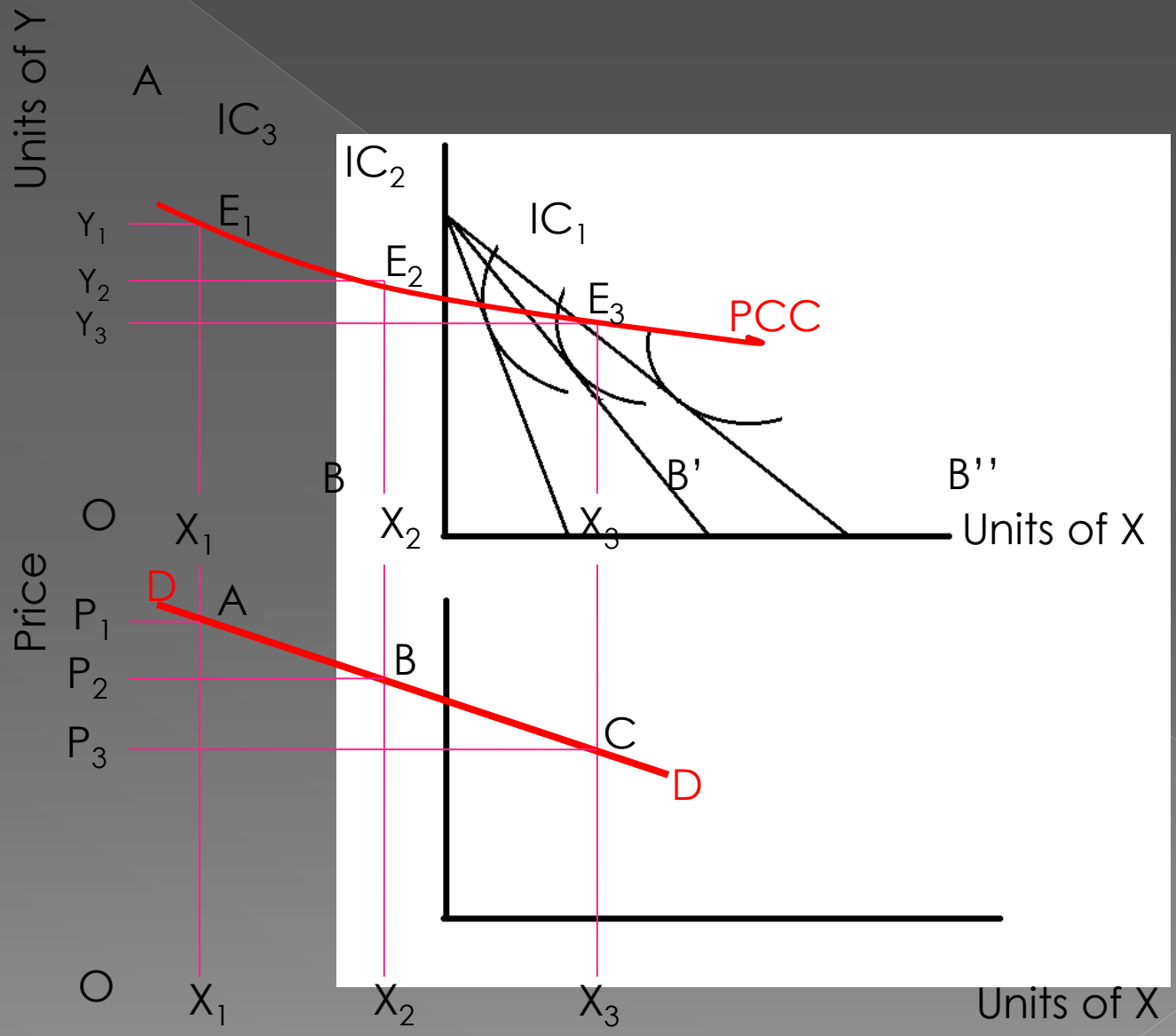
Graphically,



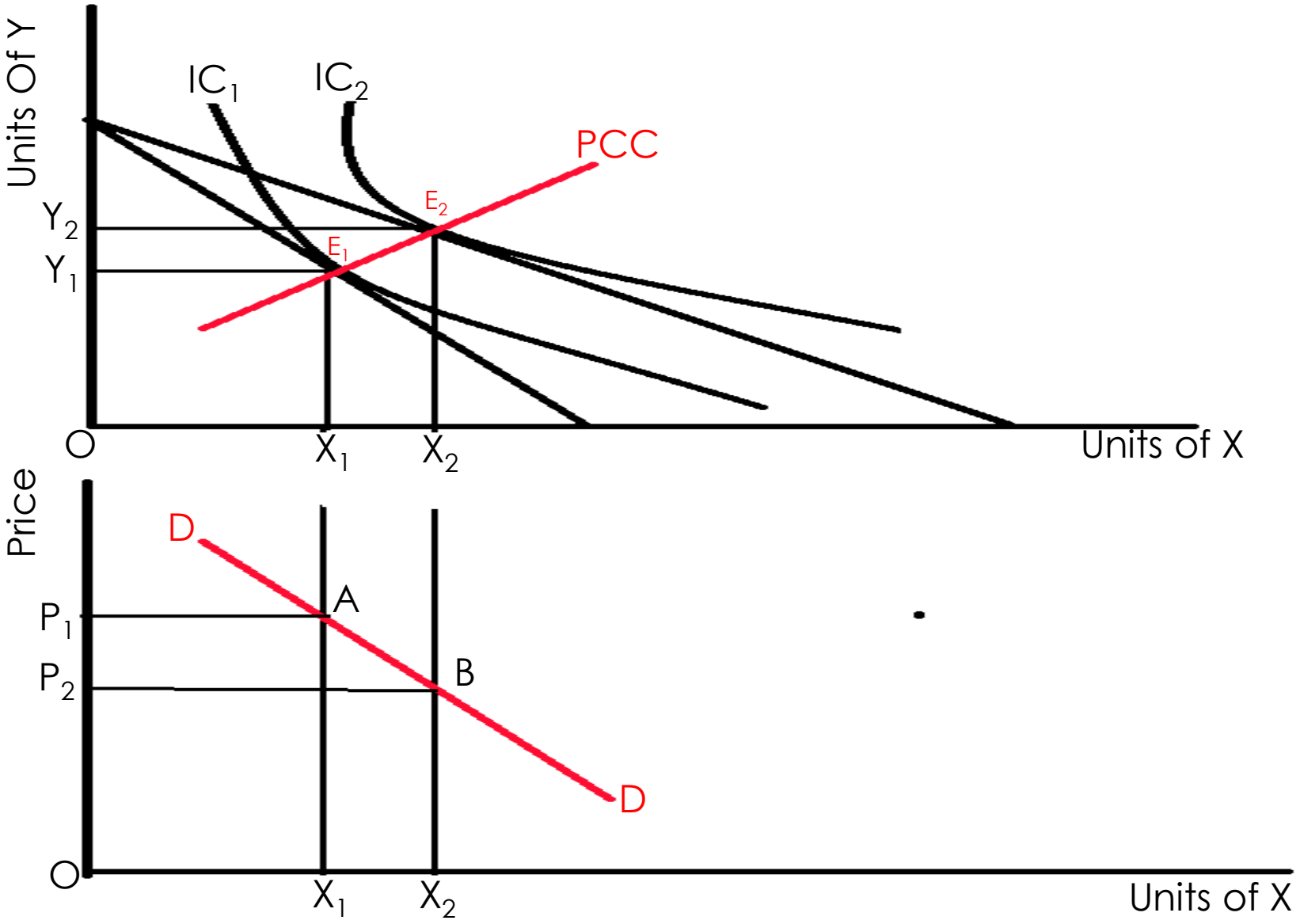
Price effect and derivation of demand curve

- Similarly as income, consumer's equilibrium point also shifts from one to another due to change in price of commodity, it is called as price effect.
- The consumer gets equilibrium in higher IC when there is decrease in price and in lower IC if there is increase in price.
- If we join the different equilibrium points of price effect we get a curve, which is called as Price Consumption Curve (PCC).
- The relationship between change in price and quantity demanded of the commodity gives demand curve, so we can derive demand curve from price effect also.
- Price effect is negative in case of normal goods and positive in case of giffen goods.

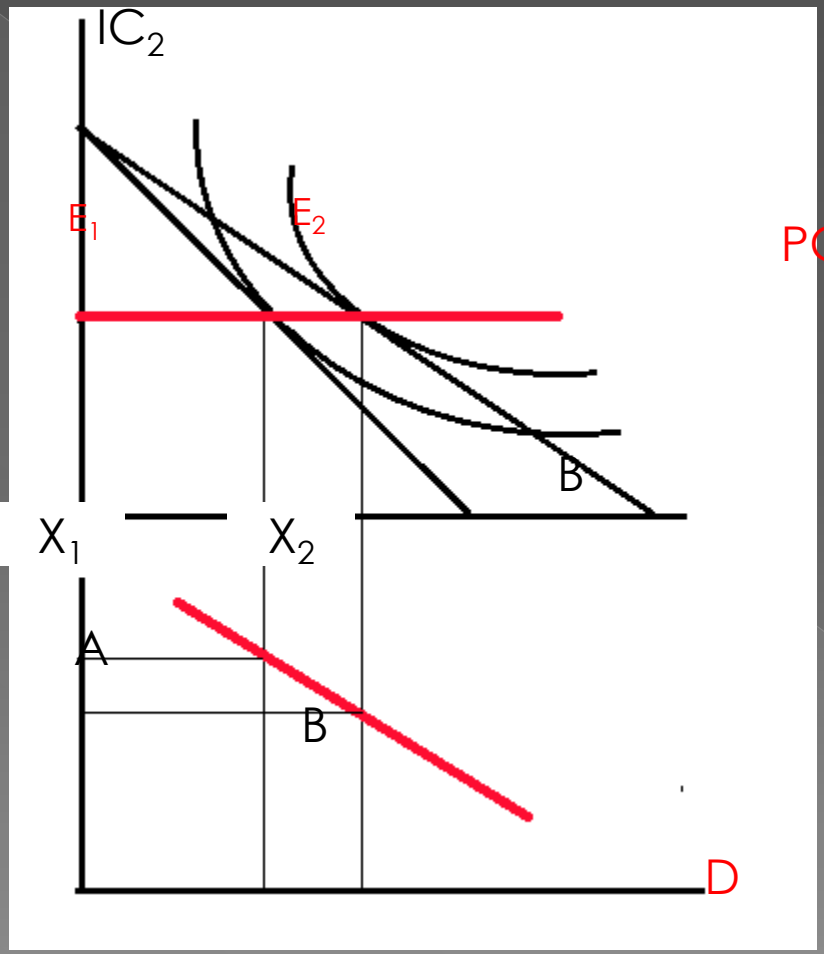
Price effect on normal goods/ if X and Y are substitutes.



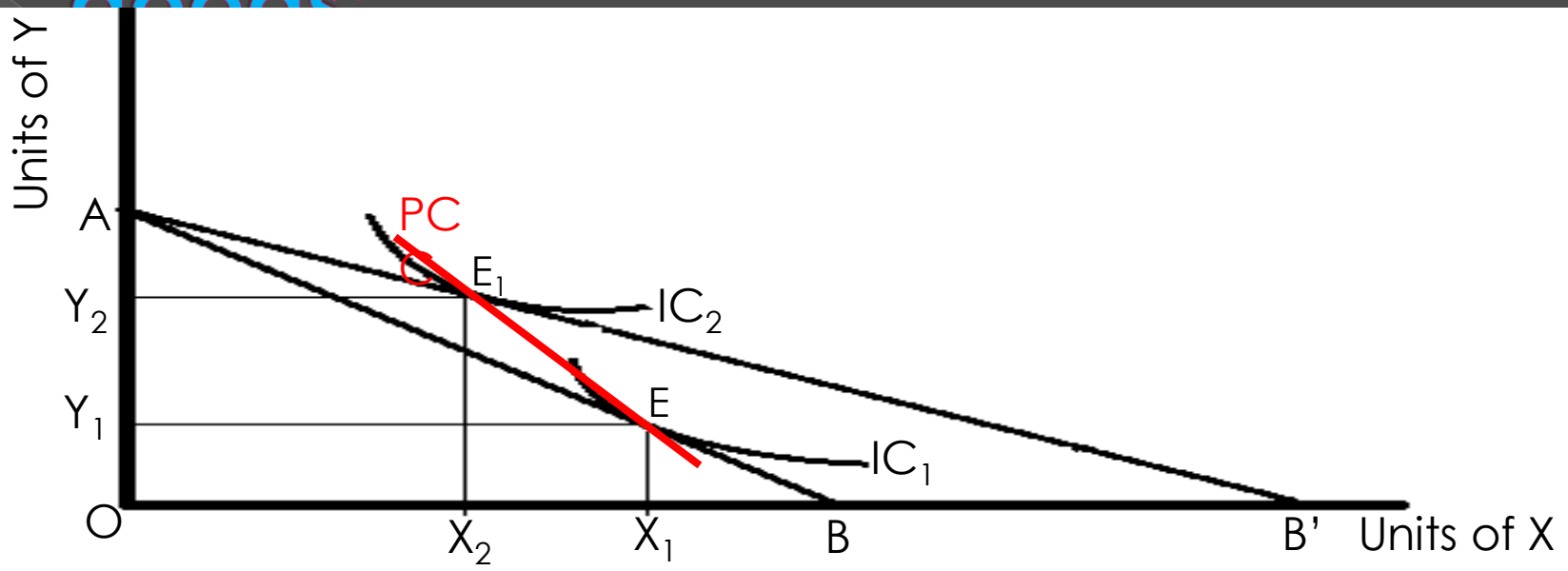
Price effect on normal goods/ if X and Y are Complements .

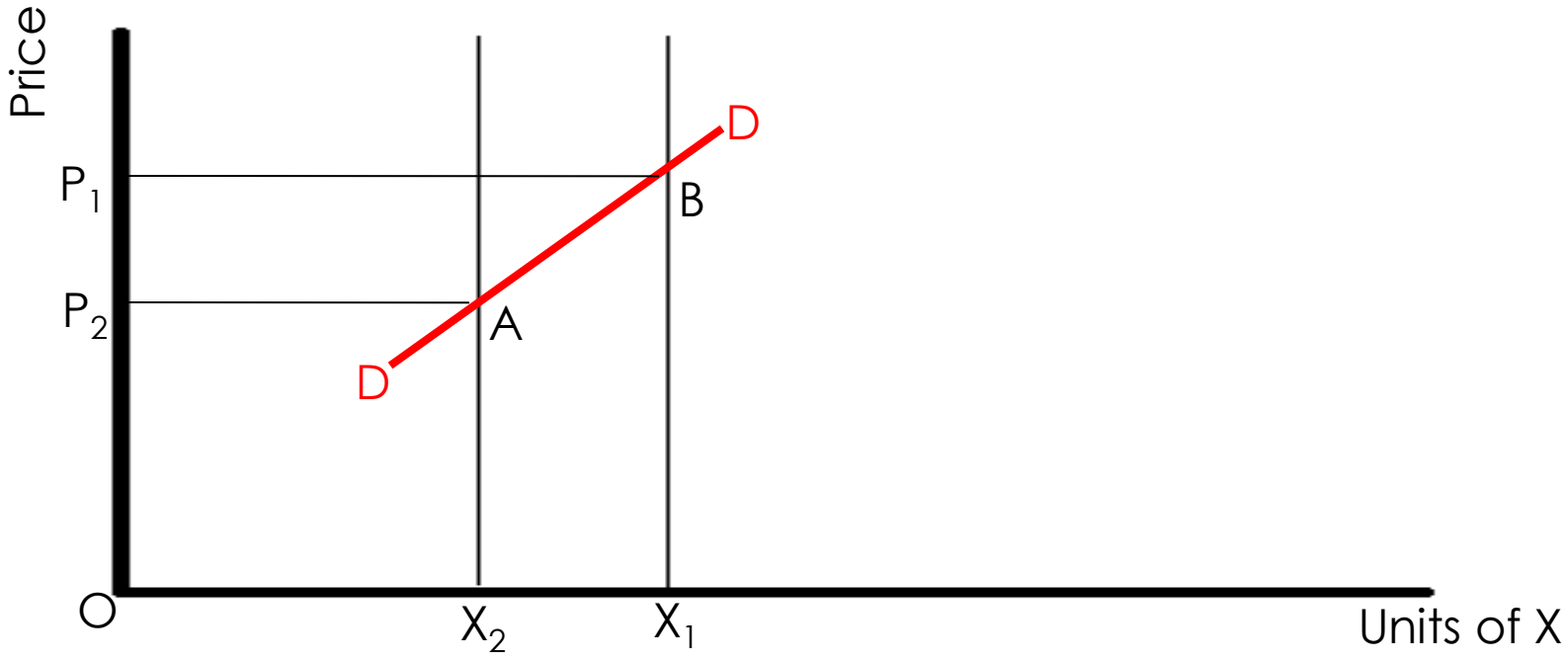


Price effect on normal goods/ if X and Y are non-related goods .



Price effect on Giffen / Veblen goods:



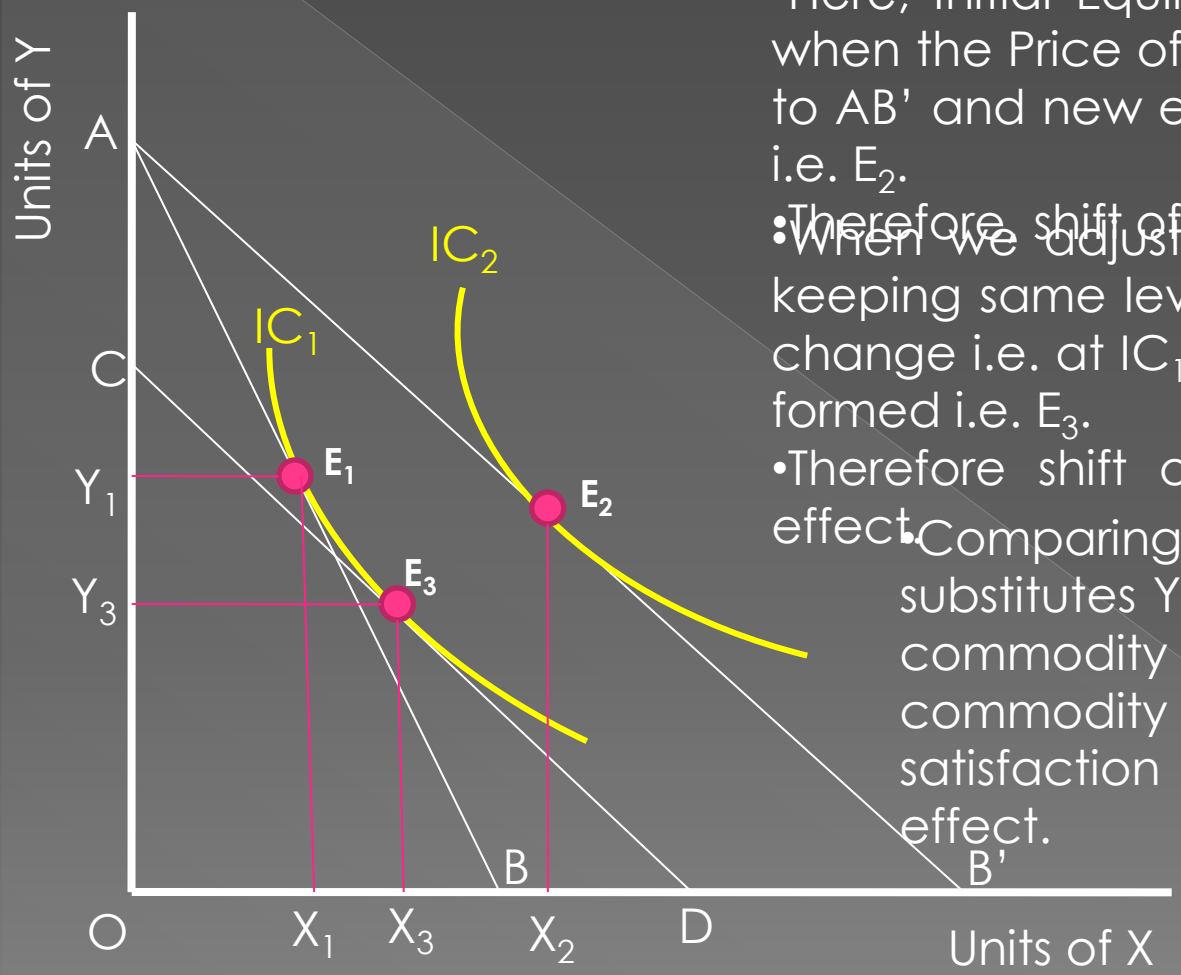


Substitution Effect:

- Substitution effect is a change in the quantity demanded of a commodity which results from a change in its price, relative to the prices of other commodities.
- It is a situation when the relative price of a commodity changes keeping satisfaction level constant the consumer will purchase more units of cheaper goods and less units of expensive goods. Or the consumer substitutes the units of expensive commodity by the units of cheaper commodity, it is called as substitution effect.
- Substitution effect is measured by rearranging the purchases made by the consumer as a result of change in the relative prices of goods, satisfaction level and real income remaining constant.

- There are two approaches to explain substitution effect:
- Hicksian approach:
- To measure substitution effect from Hicksian approach, after the change in price of a commodity the consumer's money income should be compensated in such a way that the consumer will be able to attain same level of satisfaction as previous no matter the consumer is consuming same basket of commodities or not.
- It means budget line should be adjusted in such a way that it will be tangent to the initial IC.

Substitution effect and Decomposition of Price effect into income effect and substitution effect: Hicksian Approach :



- Here, Initial Equilibrium Point of consumer is E_1 when the Price of X falls, Budget line AB will shift to AB' and new equilibrium will be formed in IC_2 i.e. E_2.
- Therefore shift of E_1 to E_2 is called price effect.
- When we adjust consumer's income to CD, keeping same level of satisfaction before price change i.e. at IC_1, new equilibrium point will be formed i.e. E_3.
- Therefore shift of E_2 to E_3 is called income effect.
- Comparing only E_1 and E_3 , the consumer substitutes Y_1Y_2 units of relatively expensive commodity by X_1X_3 units of cheaper commodity to get equal level of satisfaction which is called as Substitution effect.

Here,

Price effect = $E_1E_2 = X_1X_2$

Income effect = $E_2E_3 = X_2X_3$

Substitution effect = $E_1E_3 = X_1X_3$

Since, $X_1X_2 = X_2X_3 + X_1X_3$

P.E. = I.E. + S.E.

Applications of IC analysis:

- In determination of the amount of tax and subsidy of the consumers.
- To understand the effect of tax and subsidy to the consumers.
- To make selection between direct and indirect taxes.
- To judge the welfare effects of direct and Indirect taxes.
- Income leisure choice of the workers

Criticisms of IC analysis:

- Prof. Knight, "*IC analysis is not a step forward, it is in fact, a step backward.*"
- Robertson, "*IC is only the old wine in new bottle*."
- The main criticisms of IC analysis are:

1. IC analysis tells nothing new.
2. It is not easy to indicate the preference.
3. It cannot be easily extended to more than two goods.
4. Assumption of transitivity is not always valid.
5. It is not amenable to empirical tests.
6. It don't explain the consumer's behavior with risk and uncertainty.
7. IC analysis may look absurd in bulky goods which are indivisible.

Similarities Between the Two Approaches:

- **(i) Rationality assumption:** In the two approaches, it is assumed that the consumer behaves rationality for obtaining satisfaction from his expenditure on consumer goods. Marshall uses the term utility, and Hicks satisfaction.

- **(ii) Proportionality rule:** The equilibrium condition of the consumer in both the analysis is the proportionality rule. In cardinal utility analysis , the equilibrium condition of the consumer is:

  $MU_a / P_a = MU_b / P_b = MU_c / P_c \ldots\ldots\ldots\ldots = MU_n / P_n$

  In the Hicksian analysis, this ratio of marginal utility has been substituted by marginal rate of substitution is:

  $MRS_{xy} = P_x / P_y$

- **(iii) Diminishing MU and MRS:** Another similarity between the two types of analysis is that both assume that as the consumer gets more and more of a commodity, there is diminishing satisfaction to the consumer.

- **(iv) Same conclusion:** The cardinal utility analysis and the Hicksian indifference curve analysis both reach at the same conclusion about the consumer behavior. There is nothing new in the indifference approach.

Superiority of Hicksian Indifference Curve Analysis:

- Indifference curve technique is scientific and more realistic.
- It explains the income effect and price effect:
- It studies combination of two goods:
- Application of the principle of MRS:
- Popularity of indifference curve technique for the analysis of welfare economies

Thank You.