CITY UNIVERSITY LONDON

Microeconomics Pre-sessional September 2016

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Organisation of the Microeconomics Pre-sessional

- Introduction 10:00-10:30
- Demand and Supply 10:30-11:10

Break

- Consumer Theory 11:25-13:00

Lunch Break

- Problems – Refreshing by Doing 14:00-14:30
- Theory of the Firm 14:30 -15:30

Break

  - Problems – Refreshing by Doing 15:45 -16:30

Consumer Theory

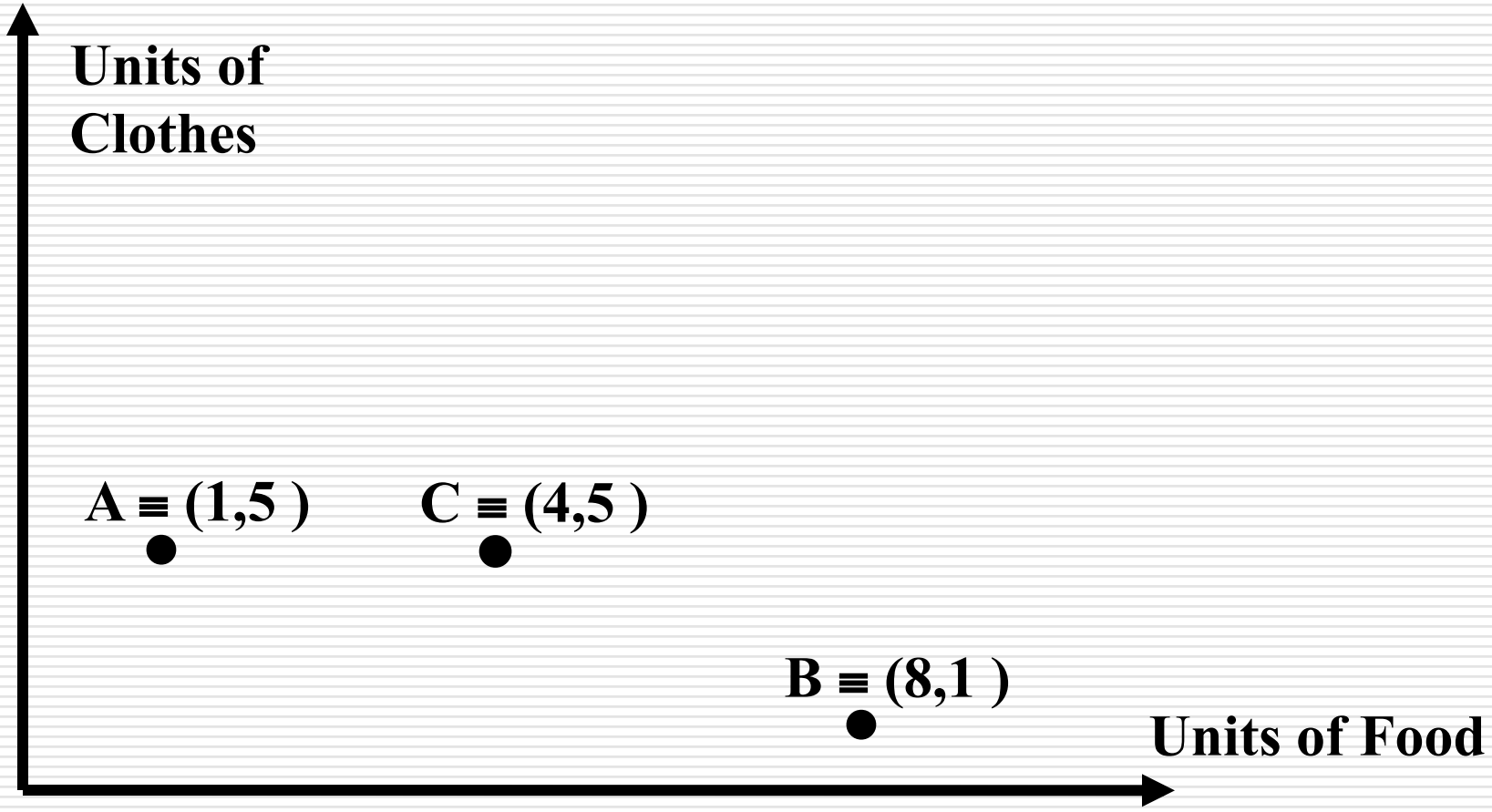
- Description of Consumer Preferences
- Utility Function
- Indifference Curves
- Marginal Rate of Substitution
- Consumer Maximisation Problem
- Individual and Aggregate Demand Curves

Description of Consumer Preferences

Consumer Preferences tell us how the consumer would rank (that is, compare the desirability of) any two combinations or allotments of goods, assuming these allotments were available to the consumer at no cost

These allotments of goods are referred to as **baskets** or **bundles**. These baskets are assumed to be available for consumption at a particular time, place and under particular physical circumstances.

Basket of Food and Clothing



Properties of Consumer Preferences

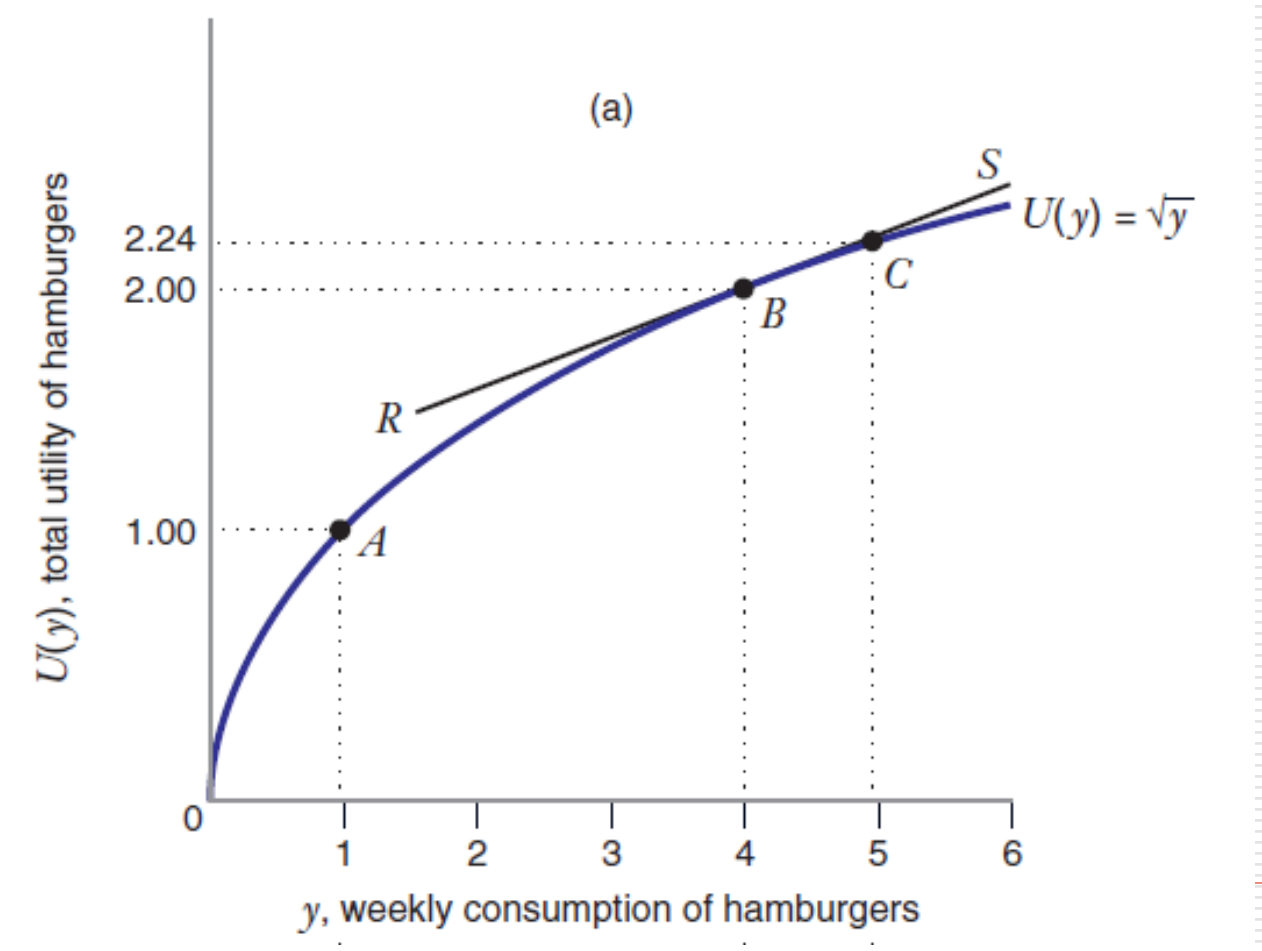
Completeness	Preferences are **complete** if the consumer can rank any two baskets of goods (A preferred to B; B preferred to A; or indifferent between A and B)
Transitivity	Preferences are transitive if a consumer who prefers basket A to basket B, and basket B to basket C also prefers basket A to basket C
Monotonicity	Preferences are monotonic if a basket with more of *at least one* good and no less of any good is preferred to the original basket (*more is better?*)

The Utility Function

The **utility function** assigns a number to each basket so that more preferred baskets get a higher number than less preferred baskets

Utility is an **ordinal** concept: the precise magnitude of the number that the function assigns has no significance

Example
Basket of One Good



Marginal Utility

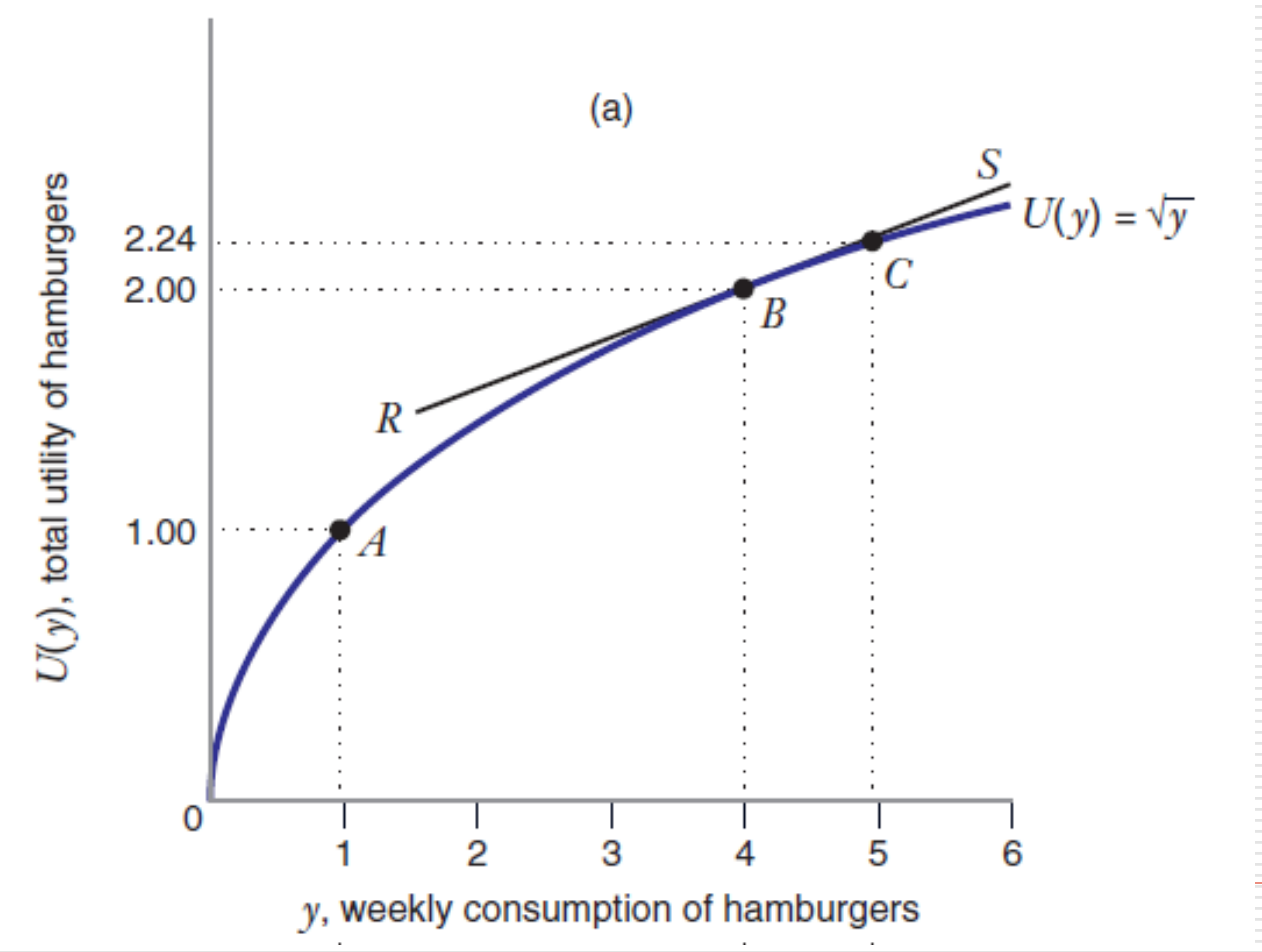
Marginal utility of a good x is the additional utility that the consumer gets from consuming a little more of x when consumption of all the other goods in the consumer's basket remains constant

$$\Delta U/\Delta x \text{ (y held constant)} = MU_x$$
$$\Delta U/\Delta y \text{ (x held constant)} = MU_y$$

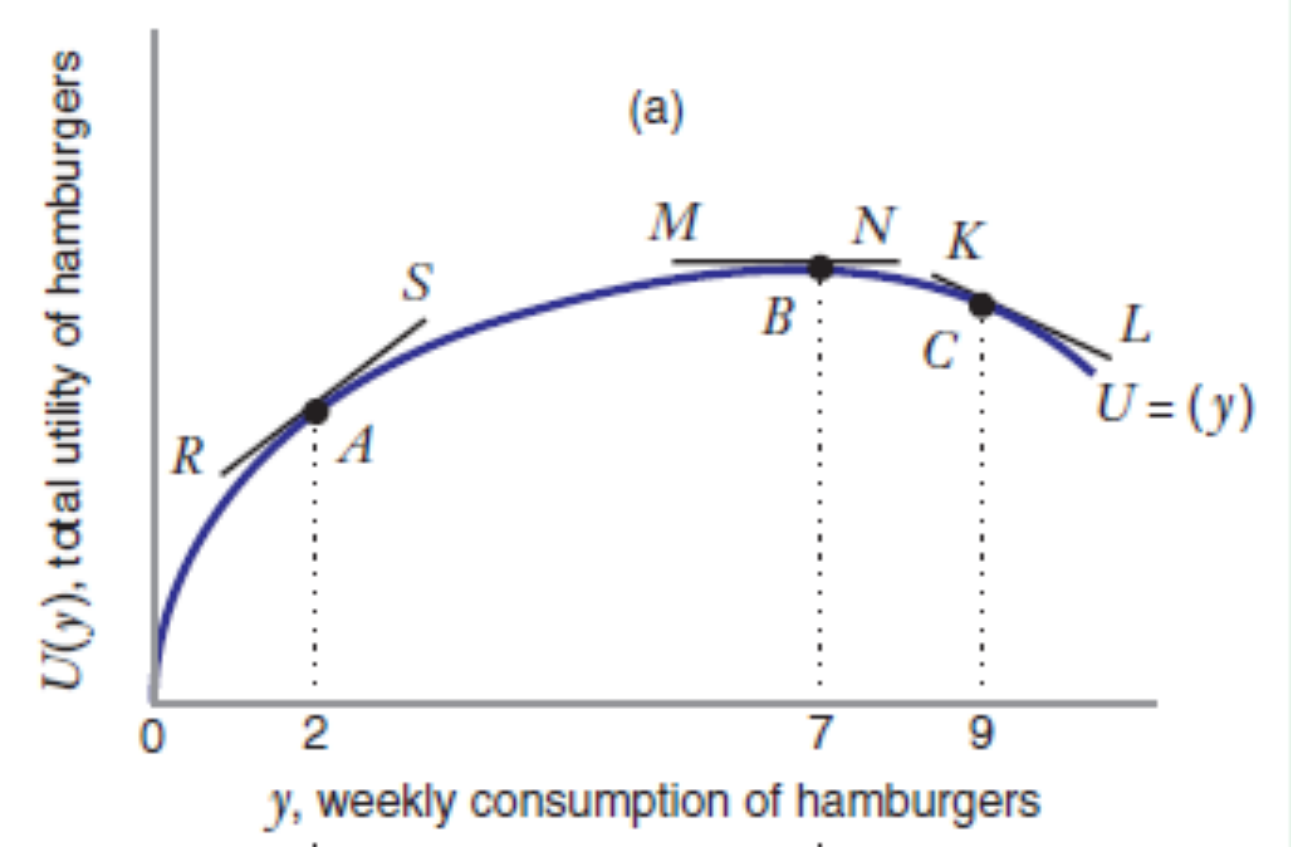
Marginal utility is measured by the slope of the utility function

The principle of **diminishing marginal utility** states that marginal utility falls as the consumer gets more of a good

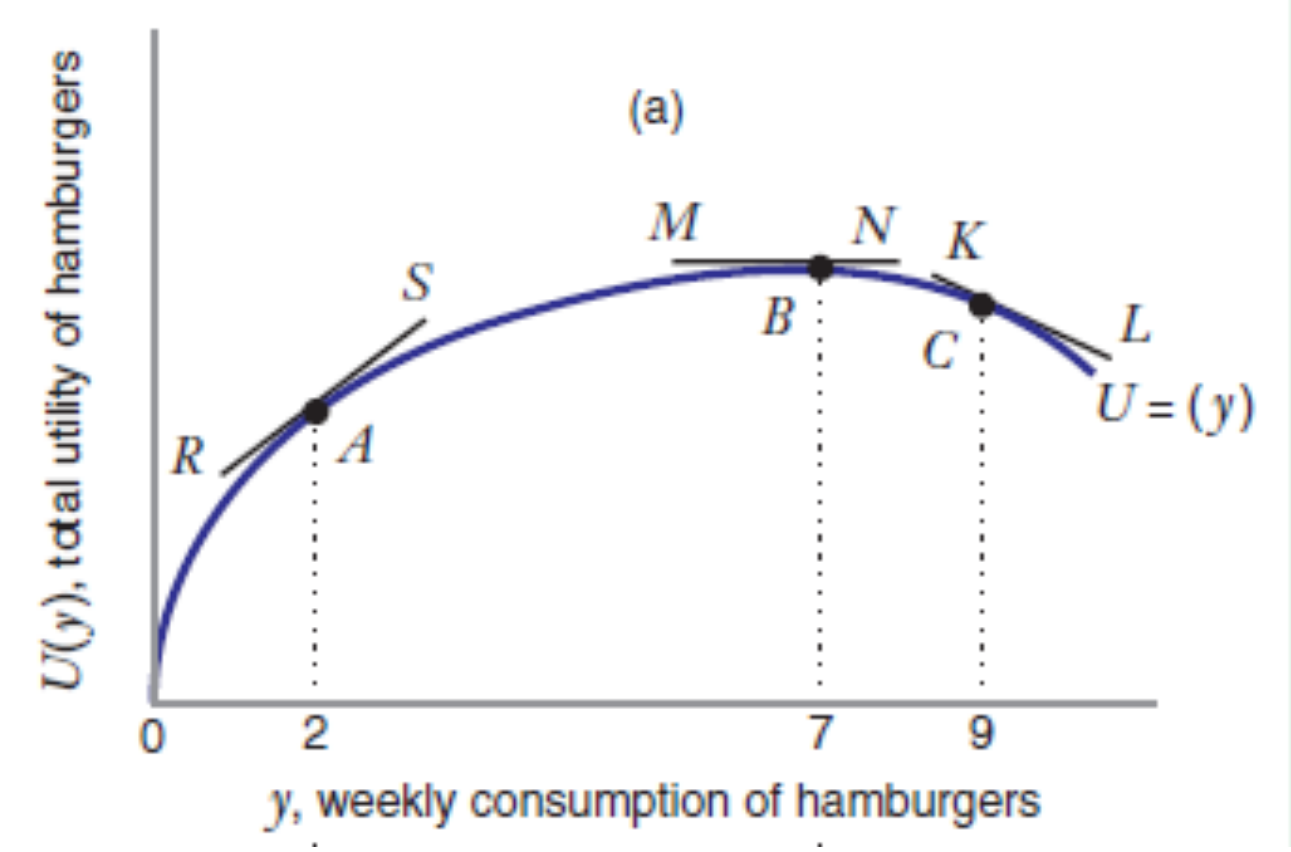
Example
Basket of One Good
The more, the better?



Example
Basket of One Good
The more, the better?



Example
Basket of One Good
Diminishing marginal utility?

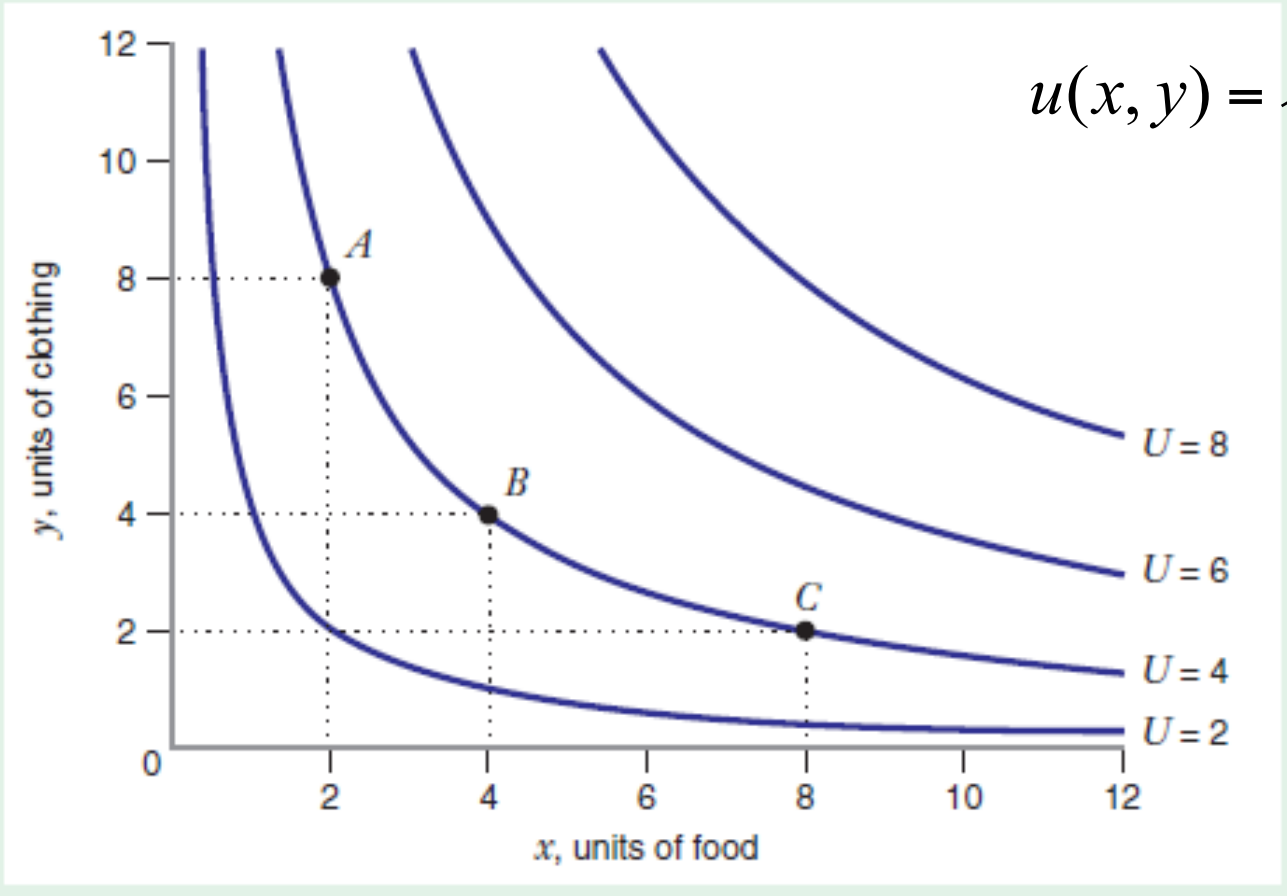


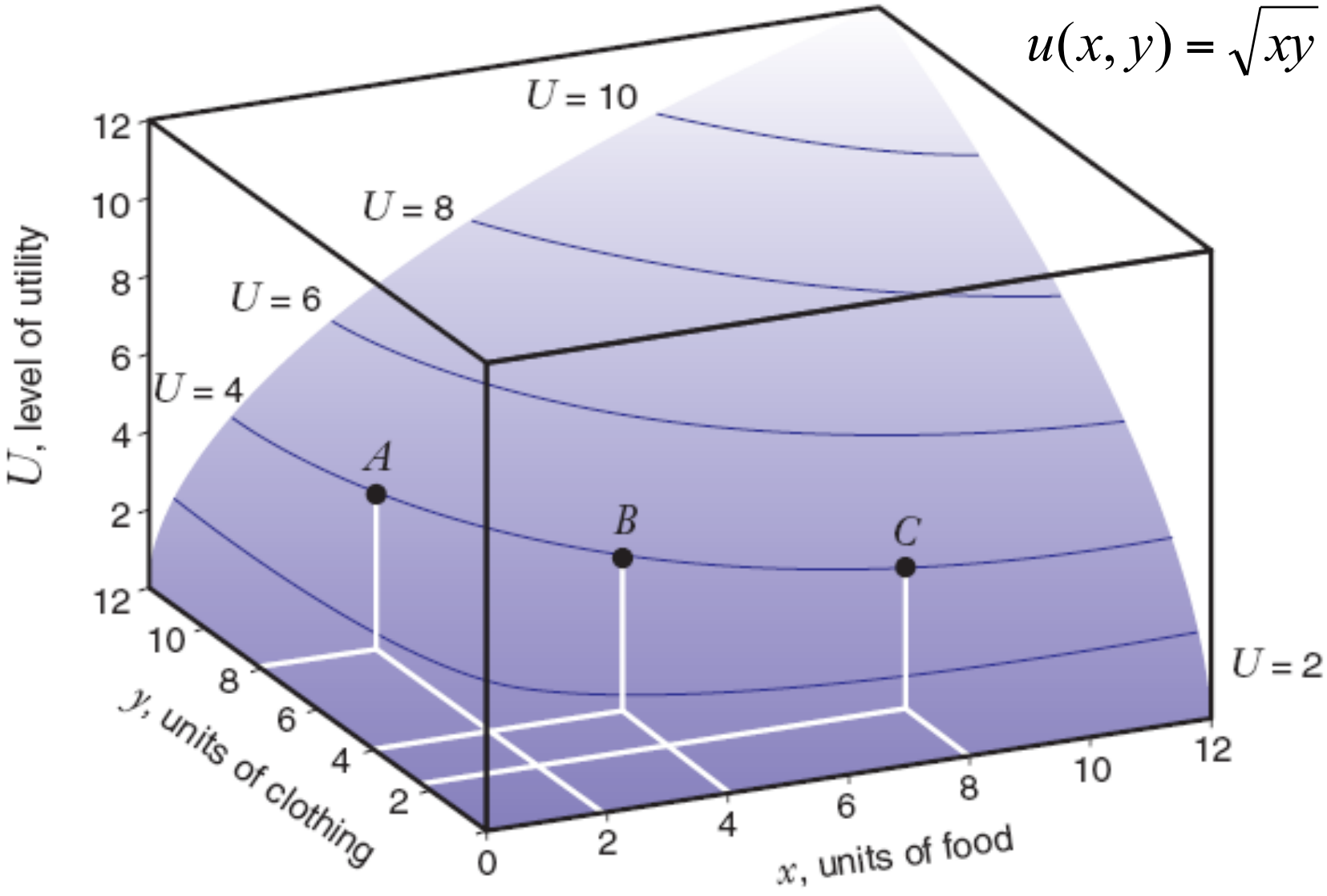
Indifference Curves

An **Indifference Curve** (or **Indifference Set**) is the set of all baskets for which the consumer is indifferent

An **Indifference Map** illustrates a set of indifference curves for a given consumer

Example
Single Indifference Curve




$u(x, y) = \sqrt{xy}$
U = 10
U = 8
U = 6
U = 4
U = 2
A
B
C
U, level of utility
12
10
8
6
4
2
y, units of clothing
x, units of food
0

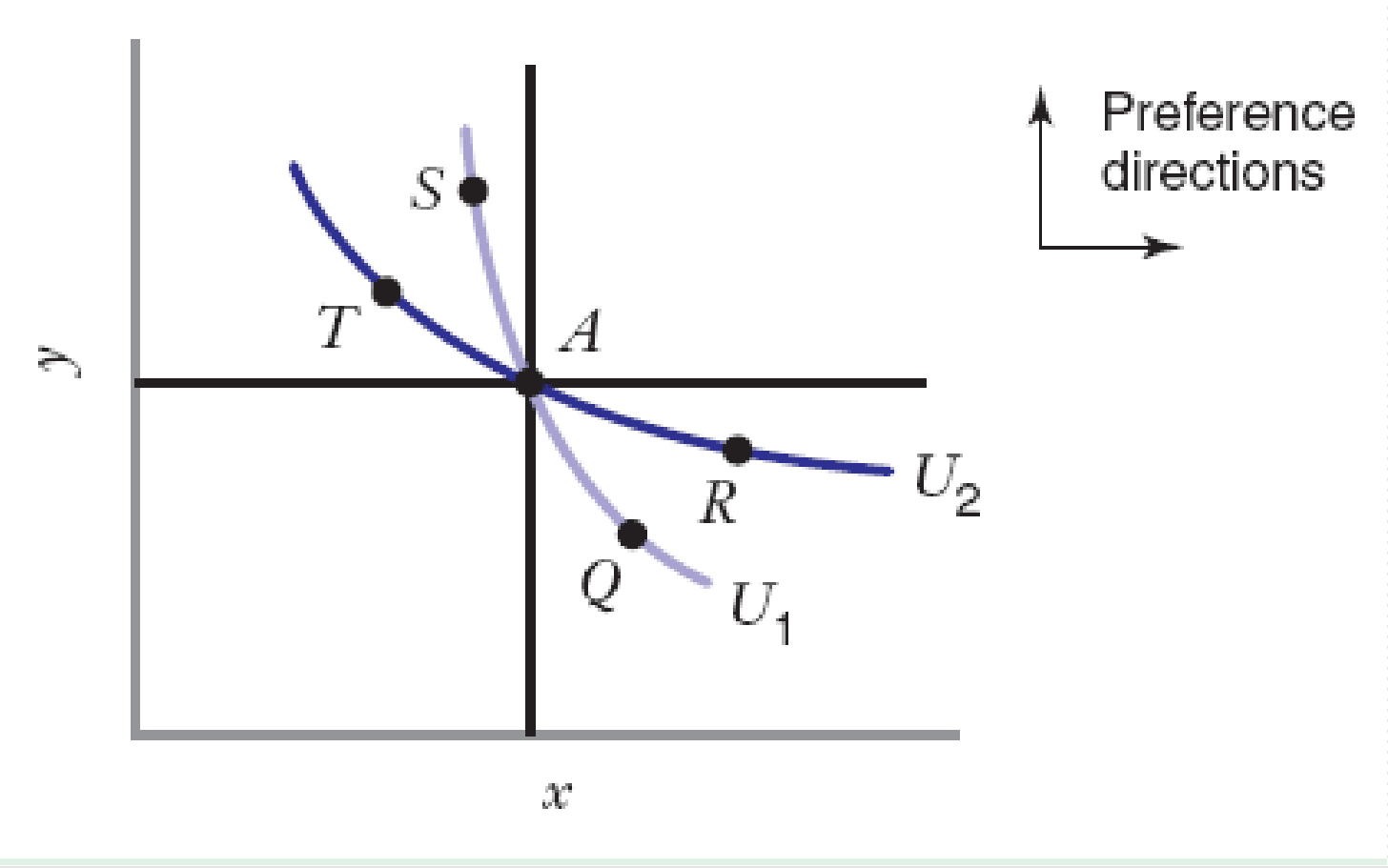
Properties of Indifference Maps

Completeness	Each basket lies on one indifference curve

Properties of Indifference Maps

Completeness	Each basket lies on one indifference curve
Transitivity	Indifference curves do not cross

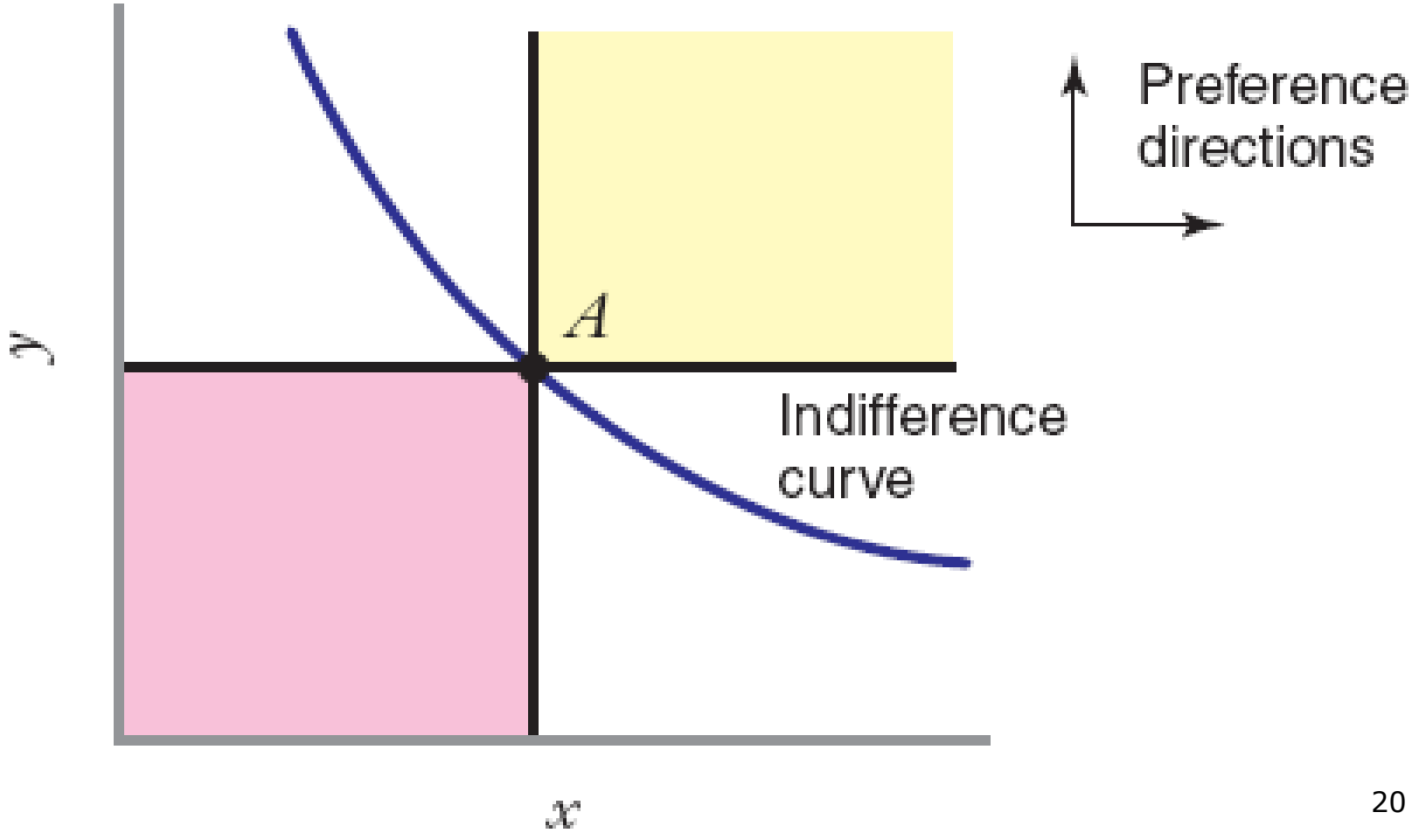
Properties of Indifference Maps



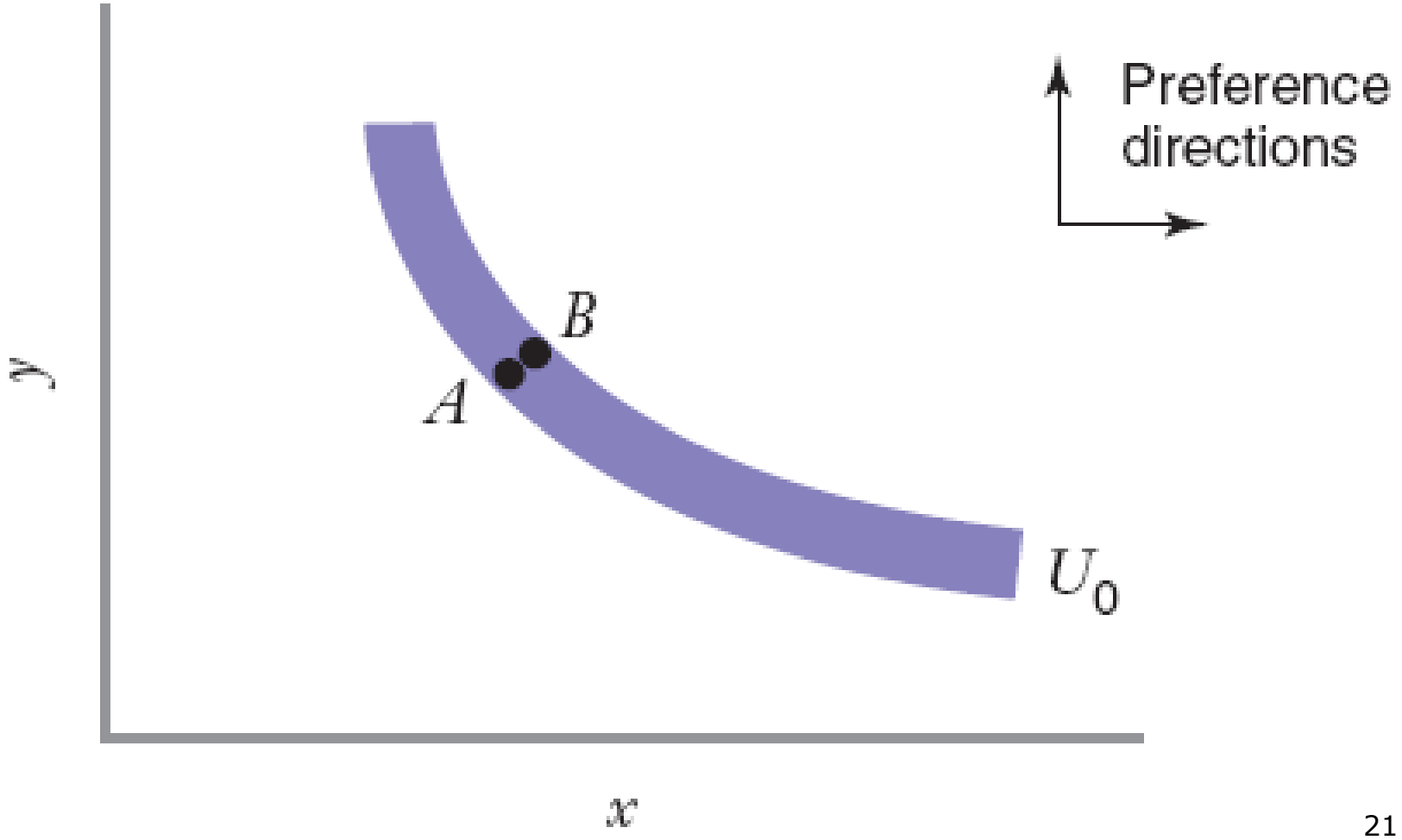
Properties of Indifference Maps

Completeness	Each basket lies on one indifference curve
Transitivity	Indifference curves do not cross
Monotonicity	Indifference curves have negative slope and are not “thick”

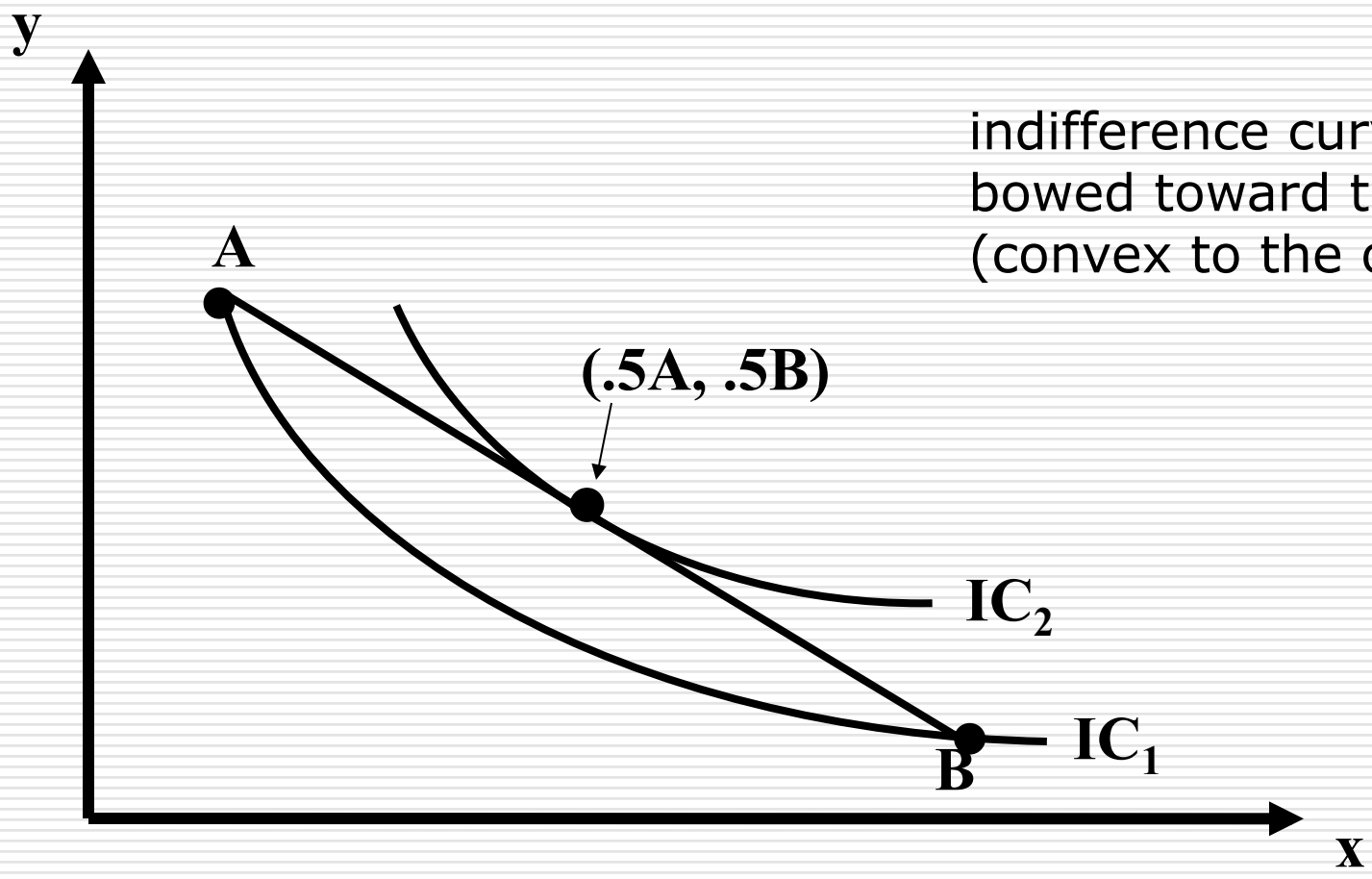
Properties of Indifference Maps



Properties of Indifference Maps

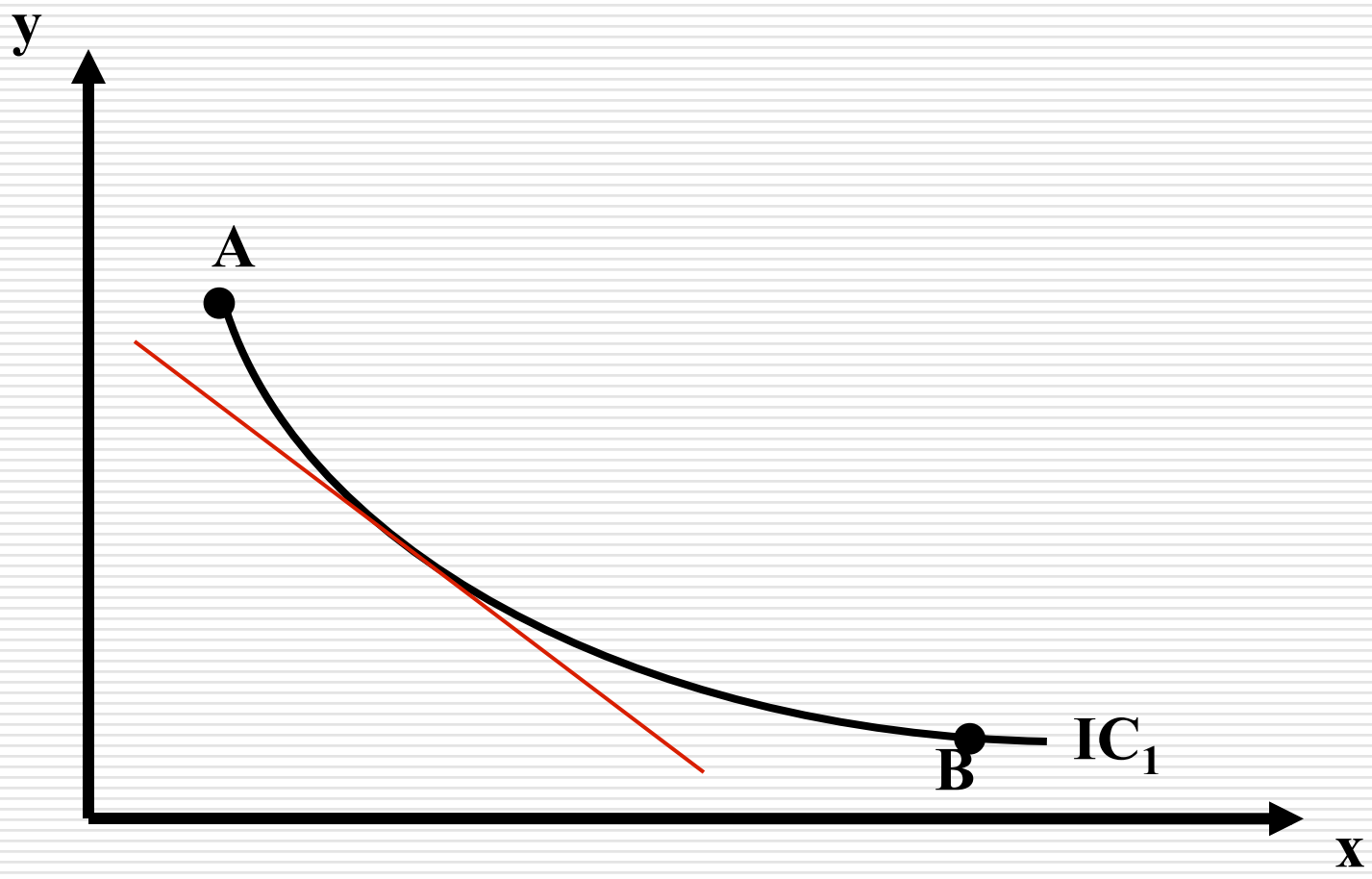


Assumption
Average Preferred to Extremes



indifference curves are bowed toward the origin (convex to the origin)

What does the slope mean?



Marginal Rate of Substitution

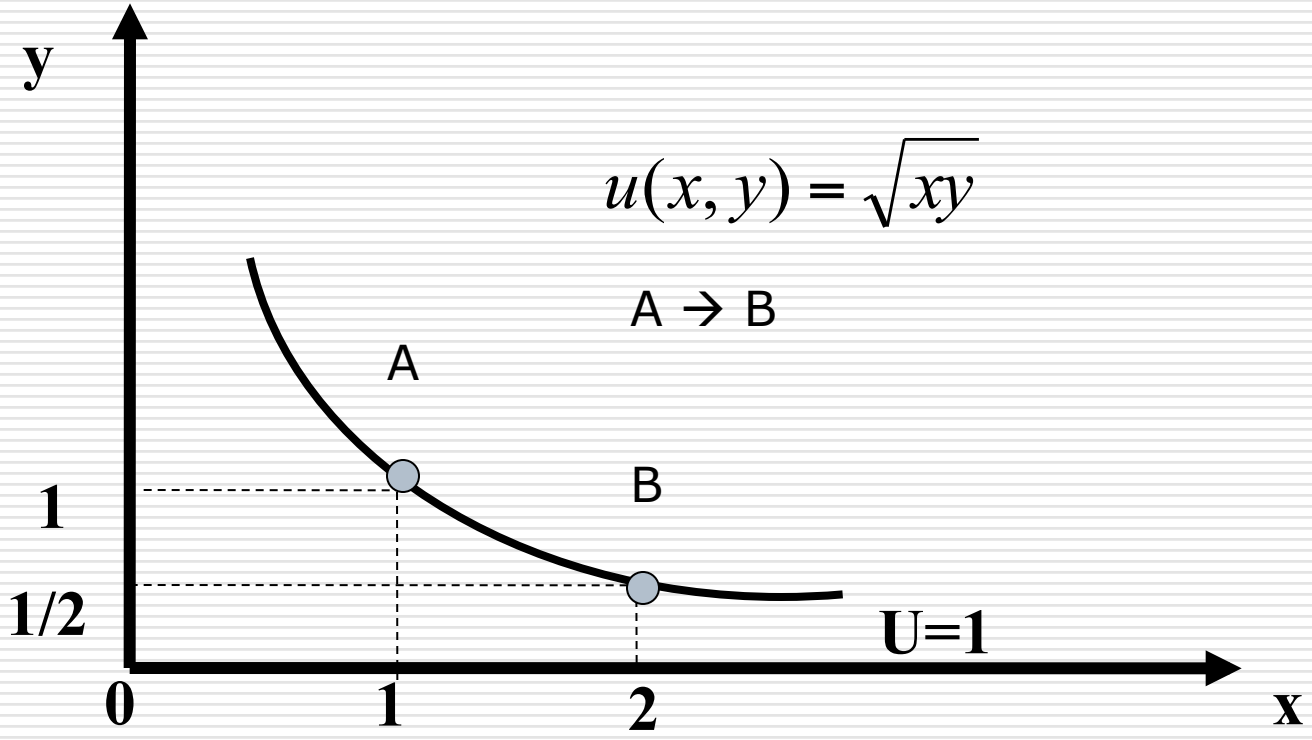
The **marginal rate of substitution** is the decrease in good y that the consumer is willing to accept in exchange for a small increase in good x (so that the consumer is just indifferent between consuming the old basket or the new basket)

The marginal rate of substitution is the rate of exchange between goods x and y that does not affect the consumer's welfare

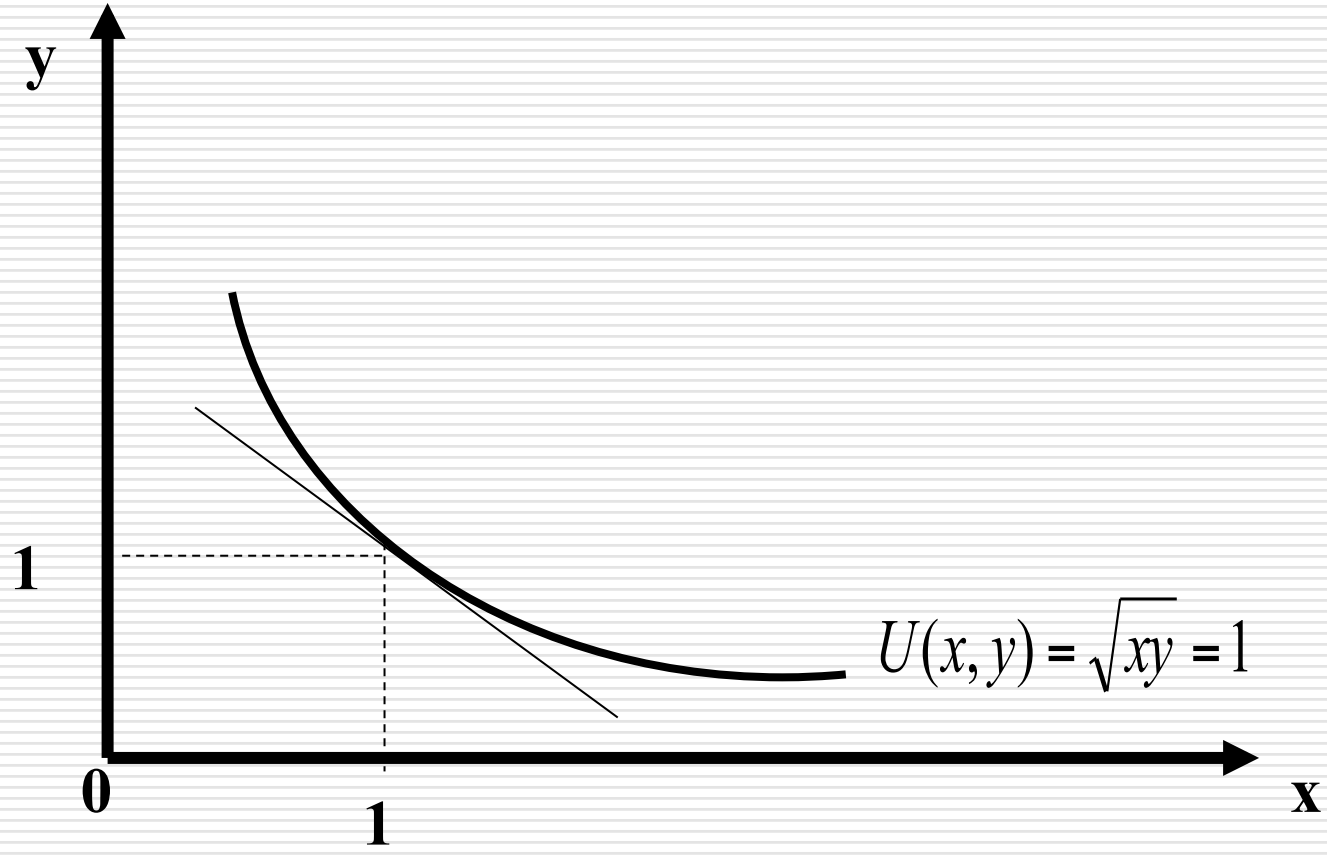
$MRS_{x,y} = -\Delta y/\Delta x$ (for a constant level of utility)

$$MRS_{x,y} = \frac{MU_x}{MU_y}$$

Example
Marginal Rate of Substitution

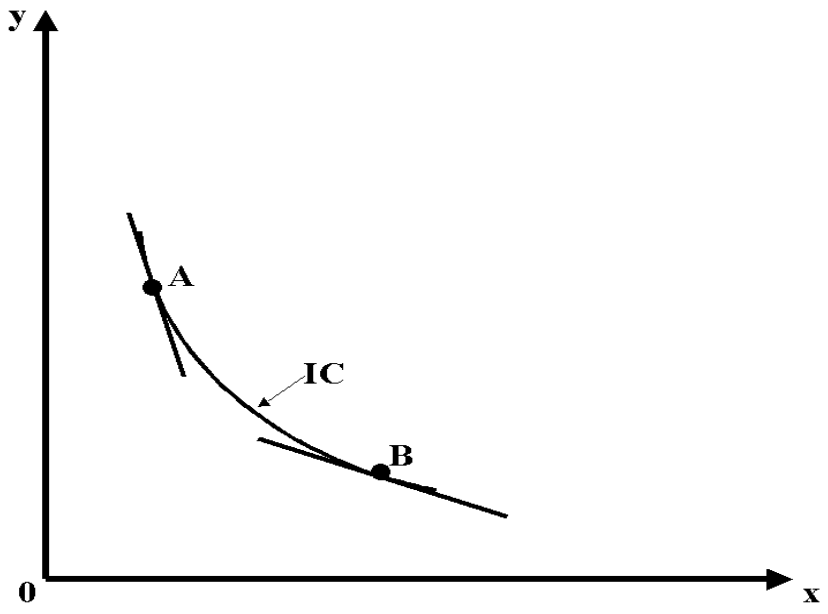


Example
Marginal Rate of Substitution



Indifference curves (usually) exhibit diminishing rate of substitution

The more of good x you have, the less of good y you are willing to give up to get a little more of good x



The indifference curves get flatter as we move out along the horizontal axis and steeper as we move up along the vertical axis

Special Functional Forms

1. Cobb-Douglas: $U(x,y) = Ax^{\alpha}y^{\beta}$

   where: $\alpha + \beta = 1$; A, α,β positive constants

2. Perfect substitutes $U(x,y) = ax + by$

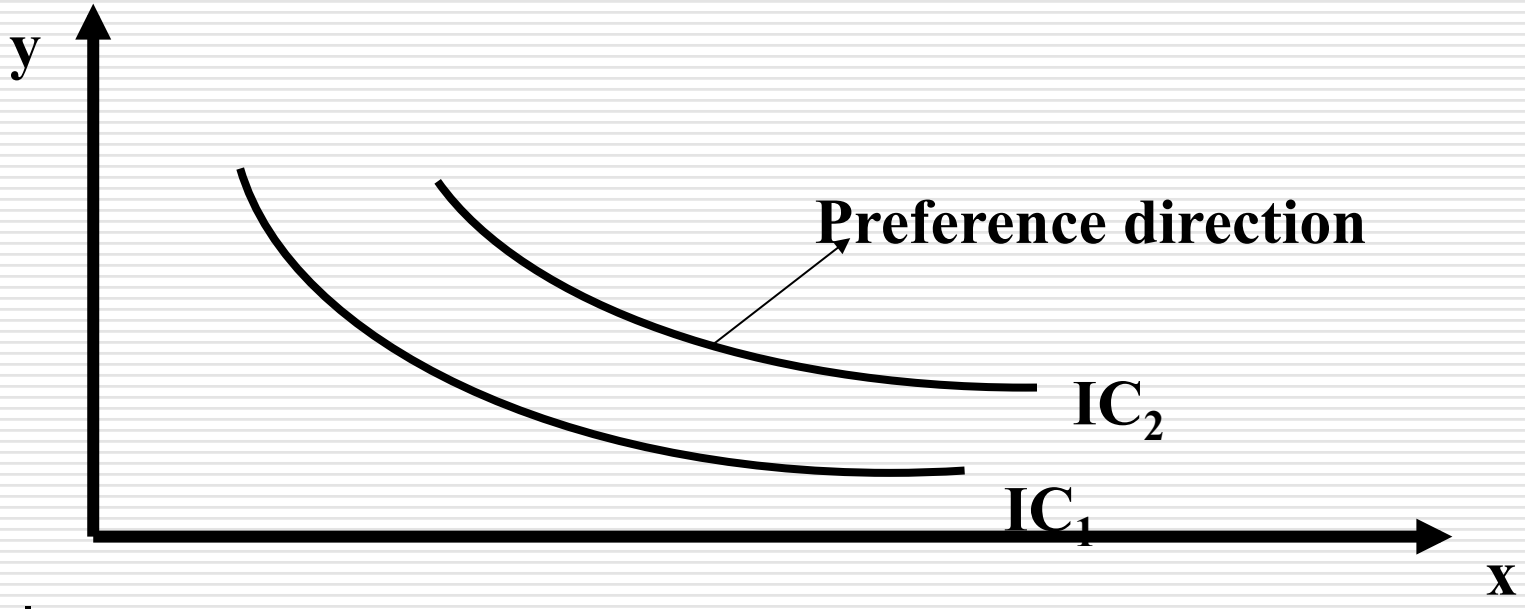
3. Perfect complements $U(x,y) = \min \{ax, by\}$

4. Quasi-linear: $U(x,y) = v(x) + by$

1. Cobb-Douglas: $U = Ax^{\alpha}y^{\beta}$

where: $\alpha + \beta = 1$; A, α,β positive constants

MRS =



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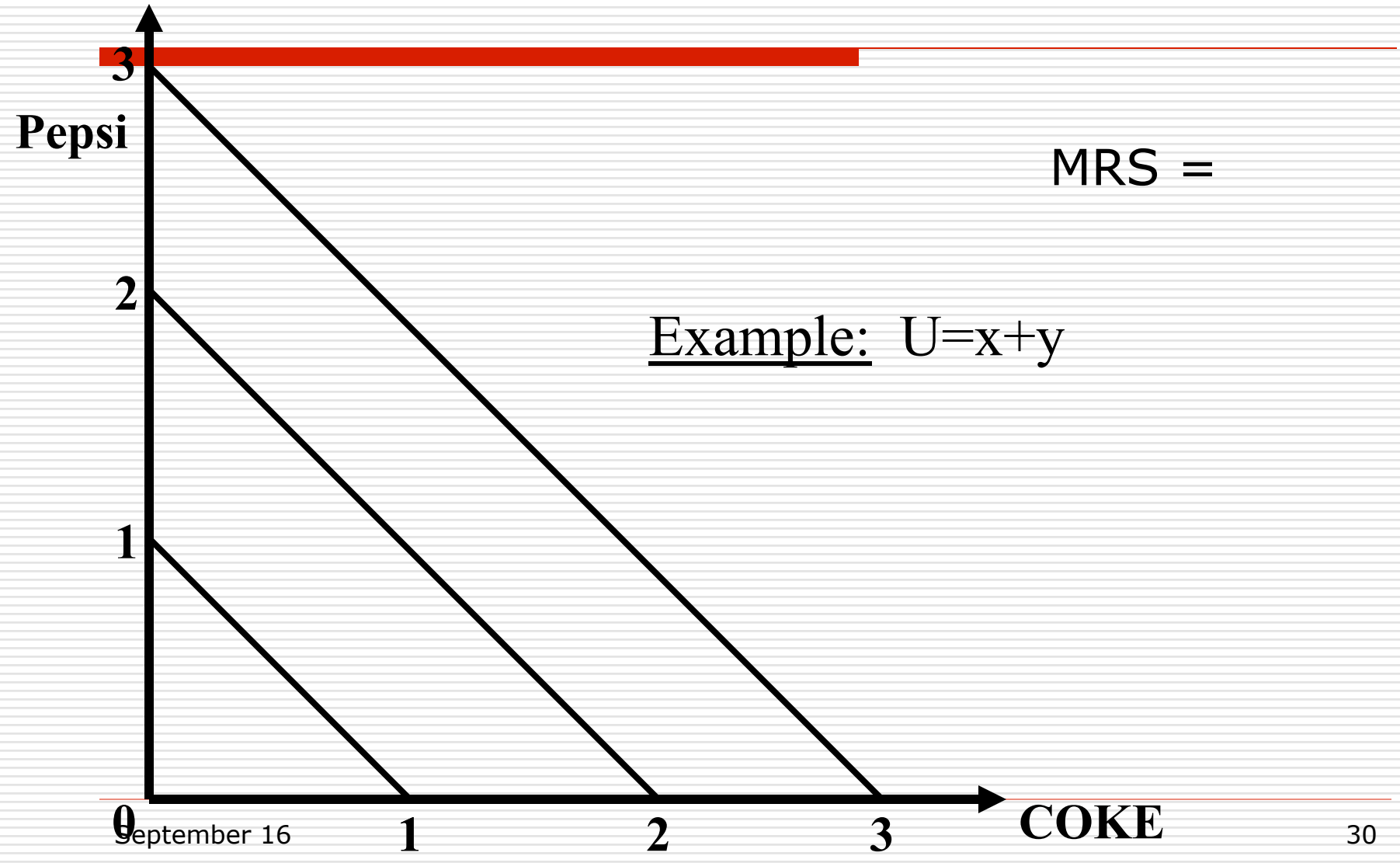
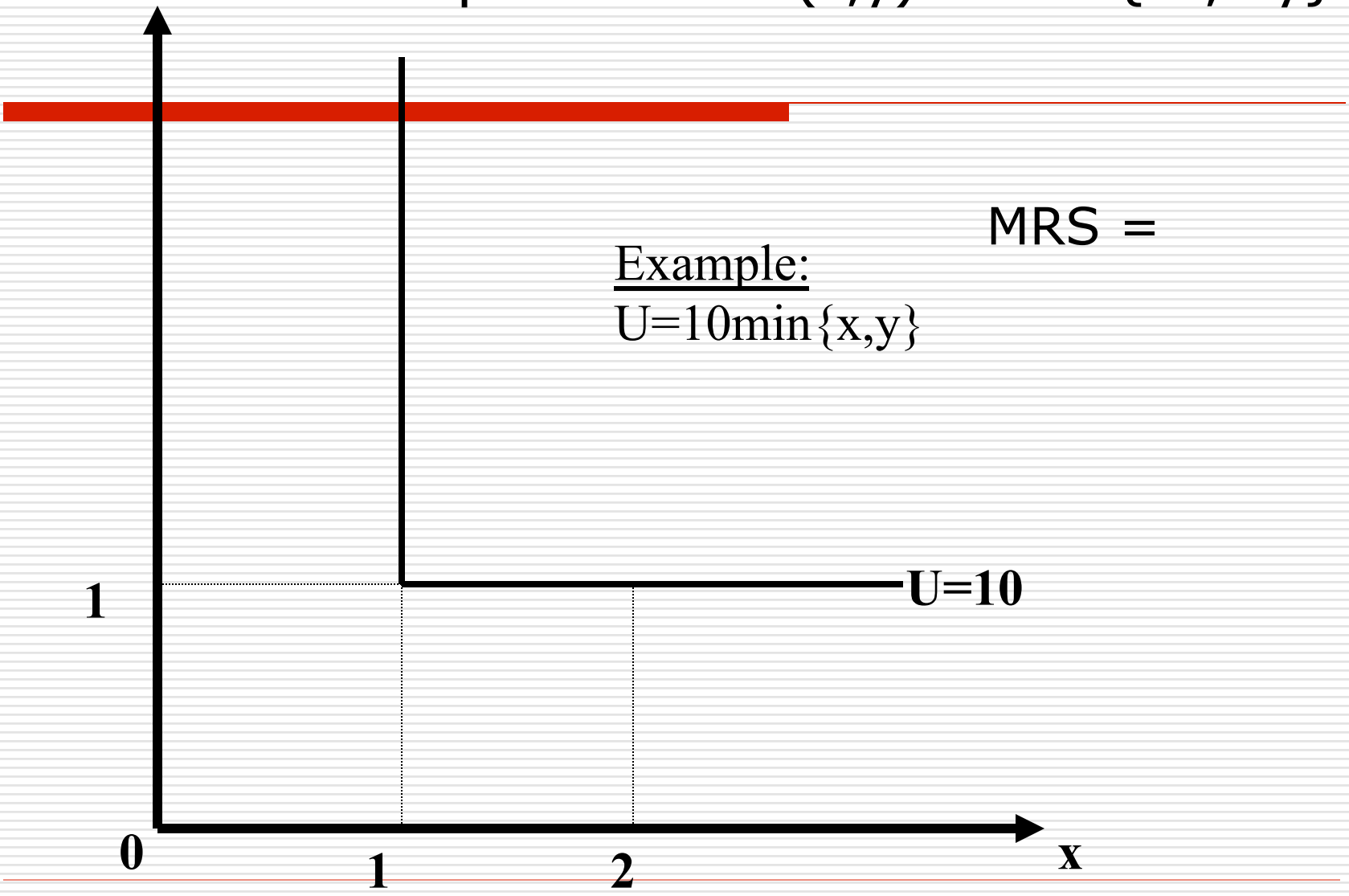
2. Perfect substitutes U(x,y) = ax + by



MRS =

Example: U=x+y

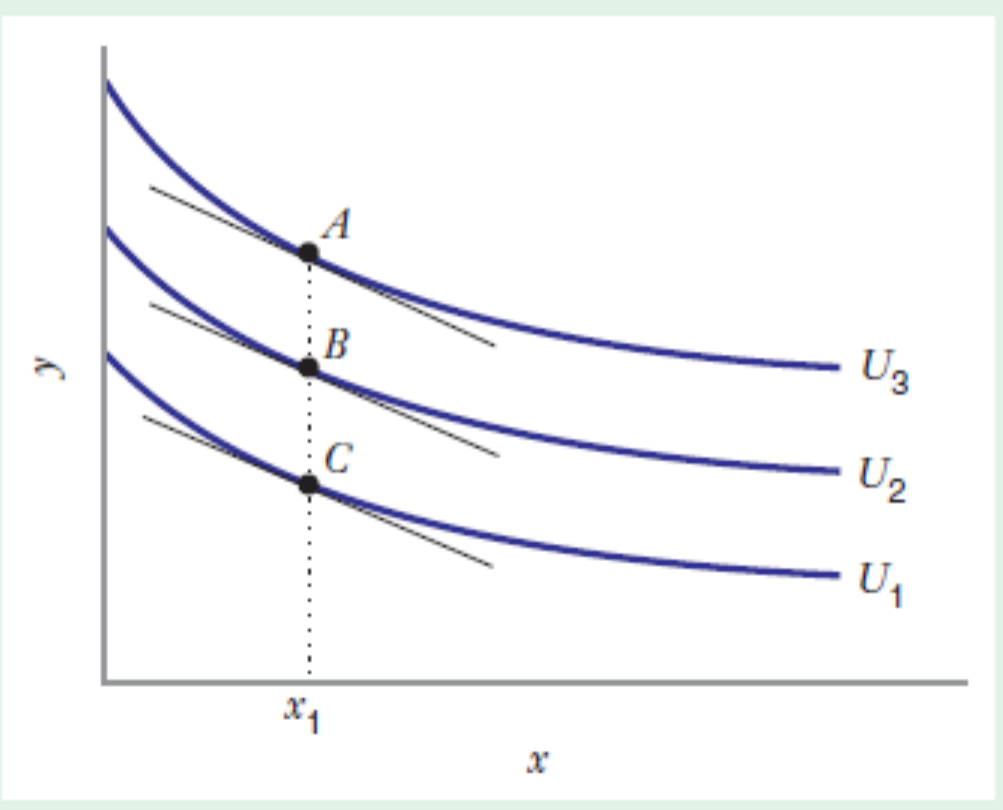
3. Perfect complements U(x,y) = min {ax, by}



4. Quasi-linear: U(x,y) = v(x) + by

Where: b is a positive constant.

$MU_x = v'(x)$, $MU_y = b$, MRSx.y = $v'(x)/ b$



The Budget Constraint

Assume only two goods available (x and y)

P_x Price of x
P_y Price of y
I Income

Total expenditure on basket (X,Y): $P_xX + P_yY$

The basket is affordable if total expenditure does not exceed total income:

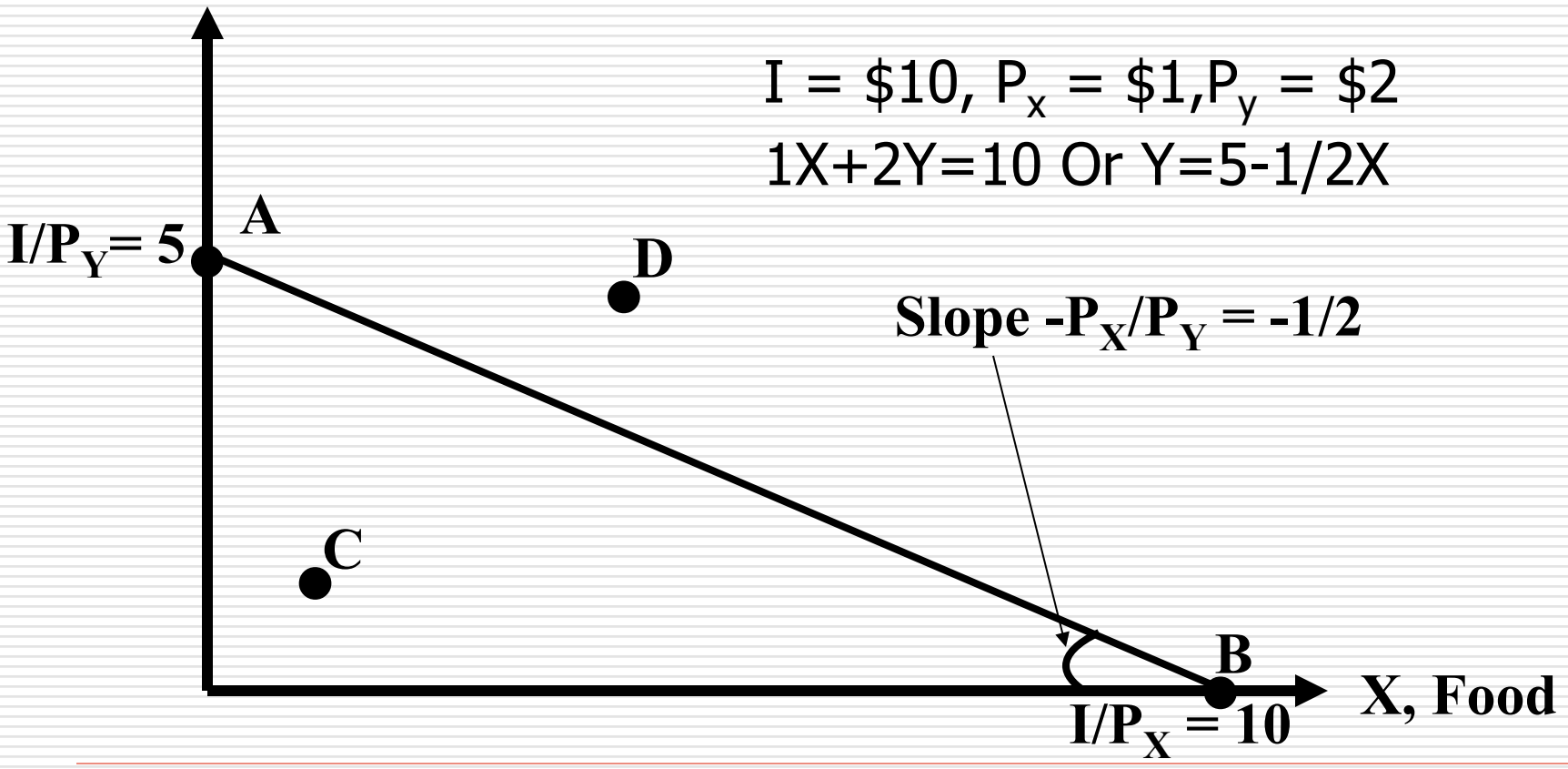
$$P_xX + P_yY \leq I$$

Example
A Budget Constraint

Two goods available: X and Y

$I = \$10, P_x = \$1, P_y = \$2$

$1X+2Y=10$ Or $Y=5-1/2X$



Definitions

The set of baskets that are affordable is the consumer's **budget set**:

$$P_xX + P_yY = I$$

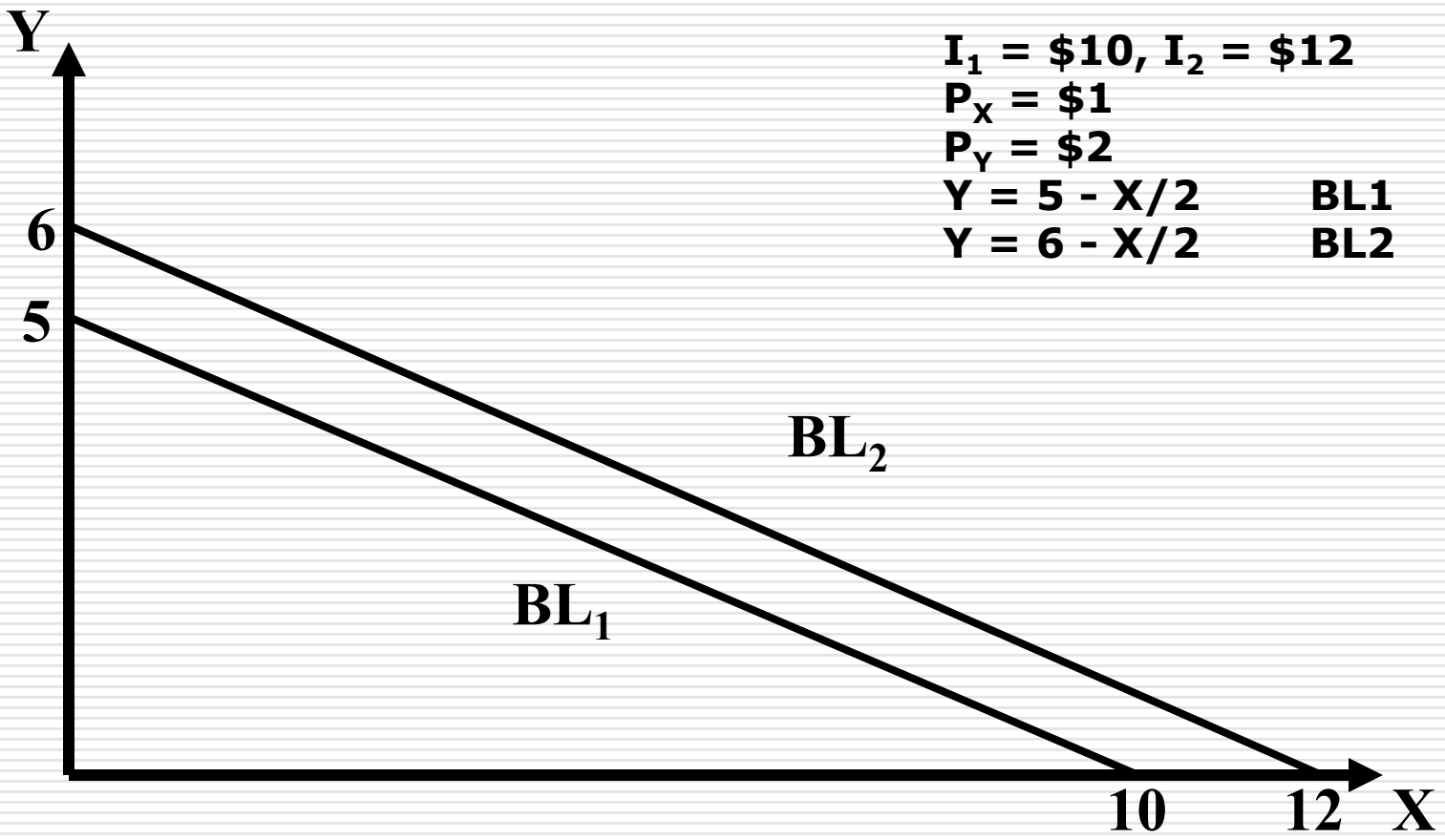
The **budget constraint** defines the set of baskets that the consumer may purchase given the income available:

$$PxX + PyY \leq I$$

The **budget line** is the set of baskets that are just affordable:

$$Y = I/P_y - (P_x/P_y)X$$

Example
A Change in Income

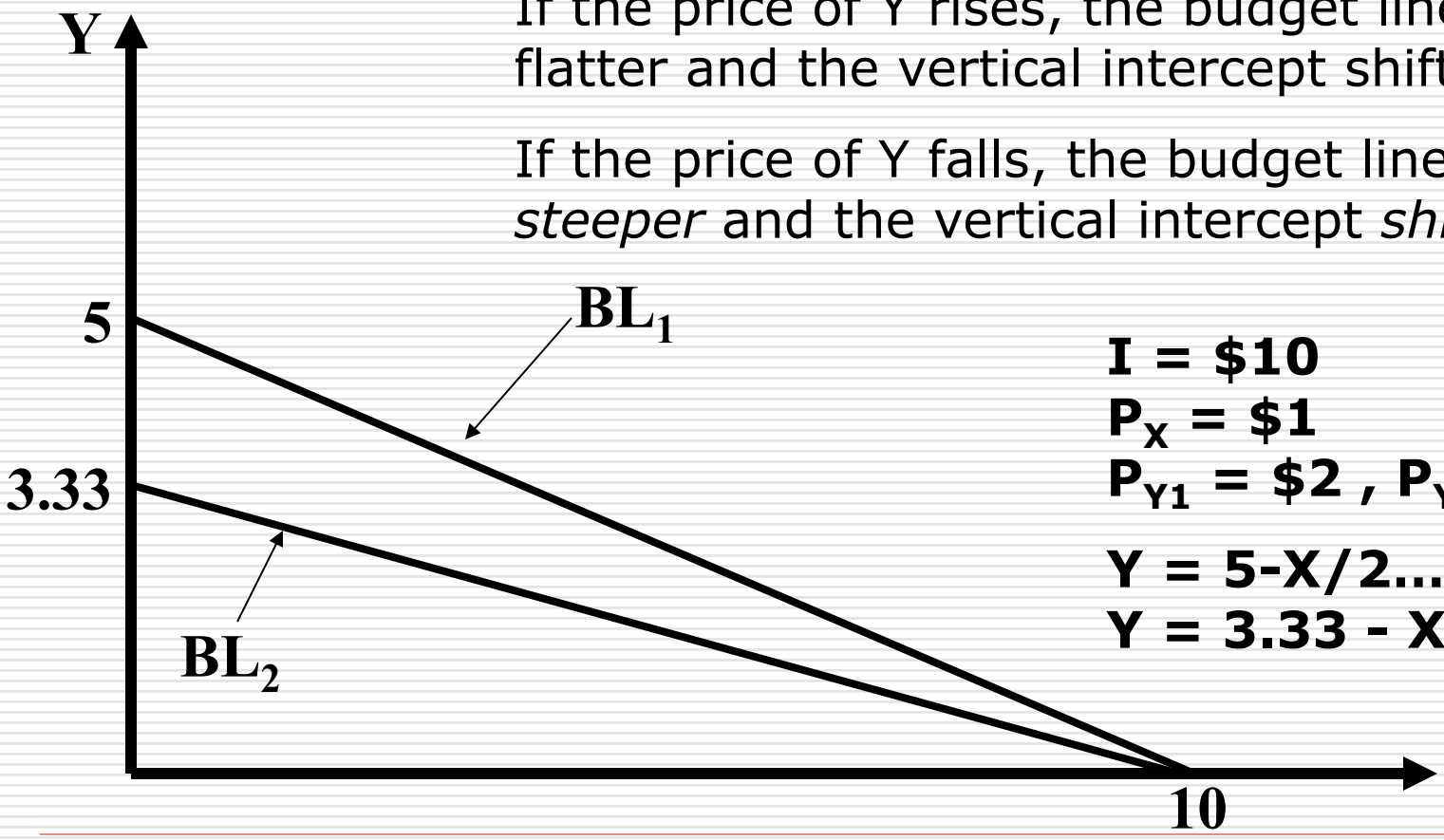


$I_1 = \$10, I_2 = \$12$
$P_X = \$1$
$P_Y = \$2$
$Y = 5 - X/2$ BL1
$Y = 6 - X/2$ BL2

Example
A Change in Price (good Y)

If the price of Y rises, the budget line gets flatter and the vertical intercept shifts down

If the price of Y falls, the budget line gets *steeper* and the vertical intercept *shifts up*



I = \$10
P_X = \$1
P_{Y1} = \$2 , P_{Y2} = \$3

Y = 5-X/2…BL_1
Y = 3.33 - X/3 …. BL_2

Consumer Choice

Assume:

- Only non-negative quantities
- "Rational" choice: The consumer chooses the basket that maximizes his satisfaction given the constraint that his budget imposes

Consumer's Problem:

$$\text{Max } U(X,Y)$$

$$\text{subject to: } P_xX + P_yY \leq I$$

Solving the Consumer Choice

Consumer's Problem:

$$\text{Max } U(X,Y)$$

$$\text{subject to: } P_xX + P_yY \leq I$$

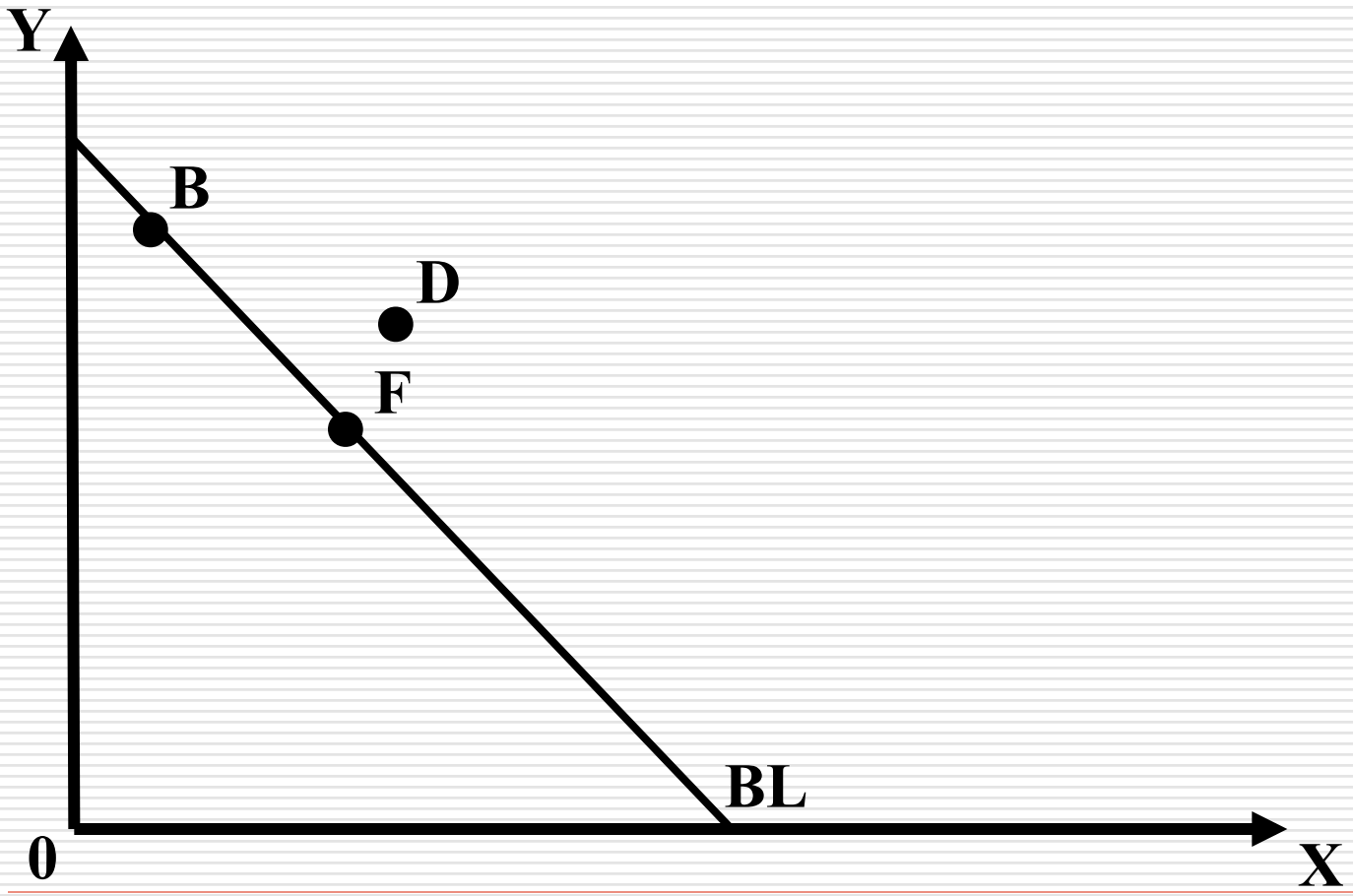
The **solution** could be:

i) Interior solution (graphically and/or algebraically)

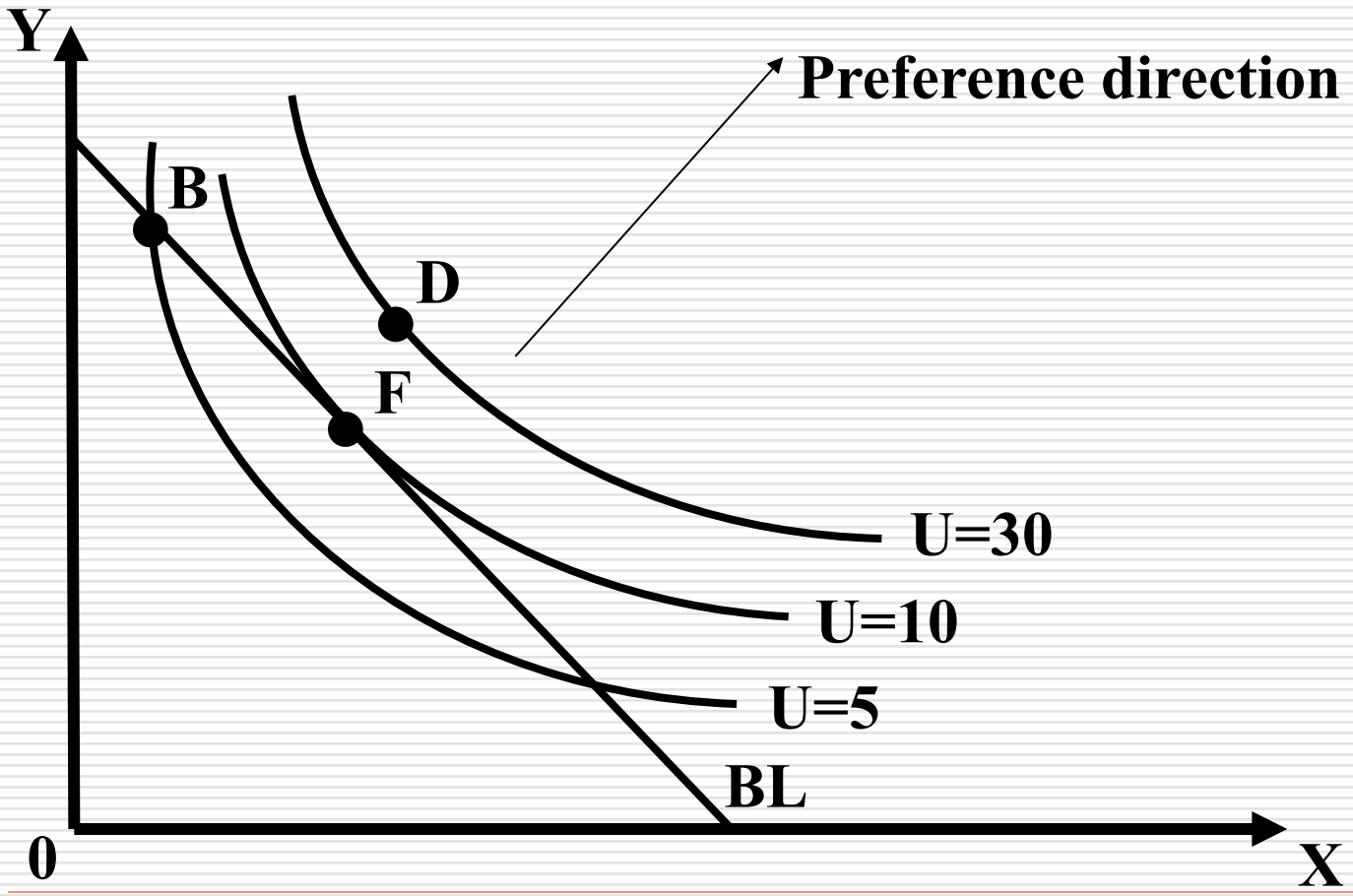
"Tangency condition"

i) Corner solution (graphically)

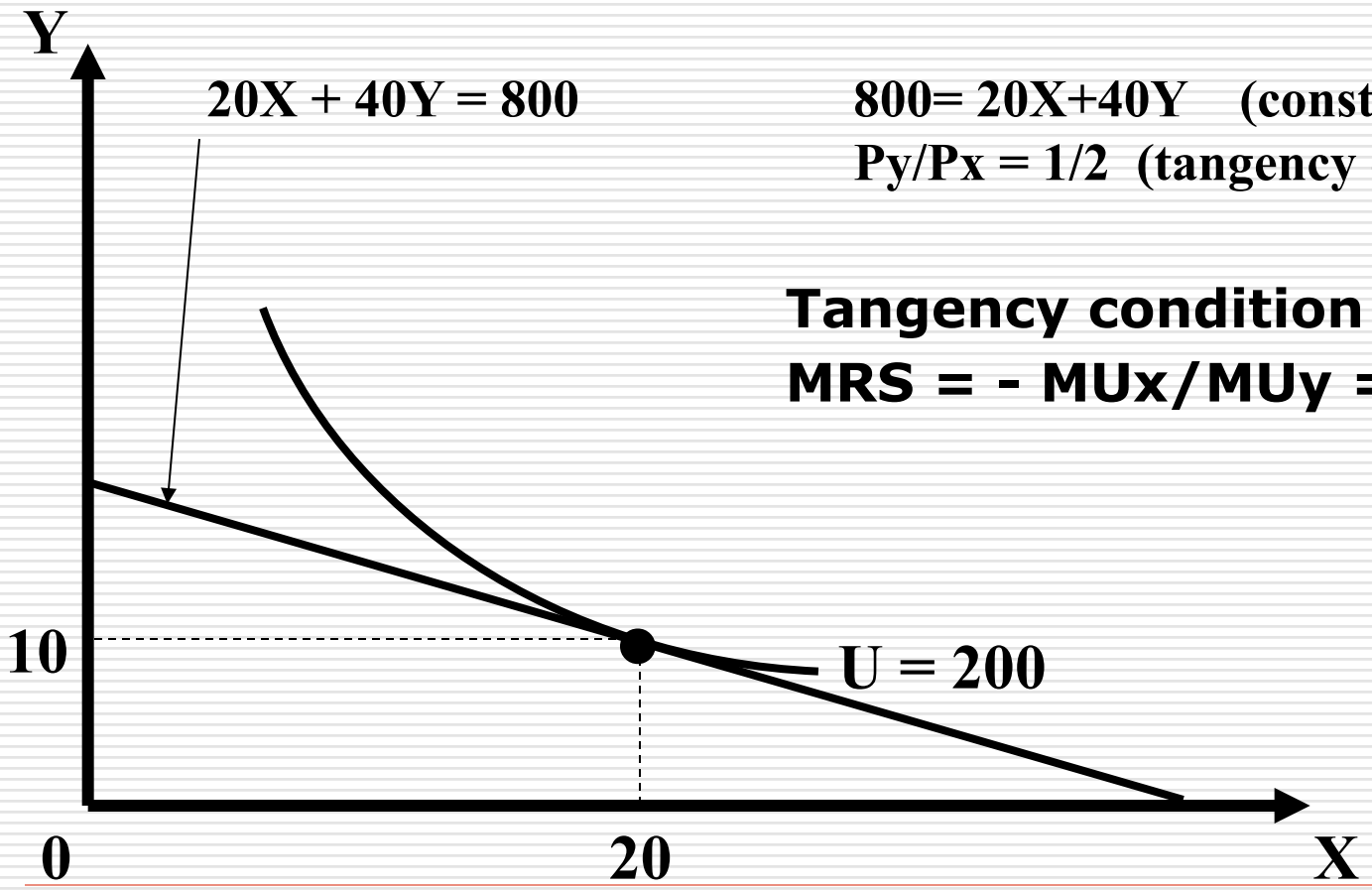
Interior Consumer Optimum



Interior Consumer Optimum



Example
Interior Consumer Optimum



800= 20X+40Y (constraint)
Py/Px = 1/2 (tangency condition)

Tangency condition:
MRS = - MUx/MUy = -Px/Py

Optimization: Tangency condition

$MRS = - MU_x/MU_y$

Slope of budget line $-P_x/P_y$

Optimality implies:

MRS *has to equal* slope of budget

So optimal choice:

$MU_x/MU_y = P_x/P_y$

Corner Consumer Optimum

A **corner solution** occurs when the optimal bundle contains none of one of the goods

The **tangency condition** may not hold at a corner solution

How do you know whether the optimal bundle is interior or at a corner?

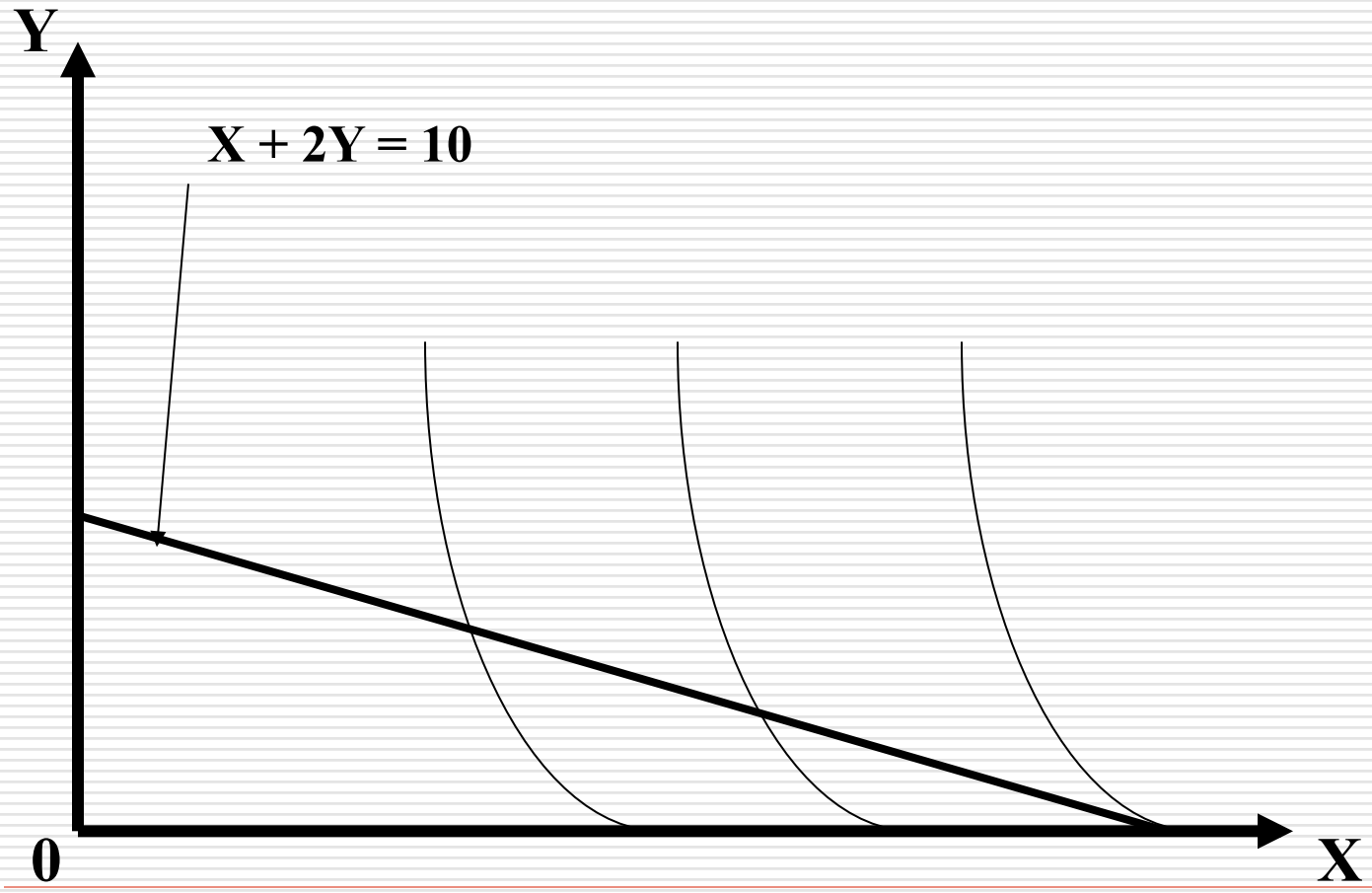
- Graph the indifference curves
- Check to see whether tangency condition ever holds at positive quantities of X and Y

Example
Interior Consumer Optimum

U(X,Y) = min(X,Y)
I = $1000
P_X = $50
P_Y = $200

Budget line
Y = $5 - X/4

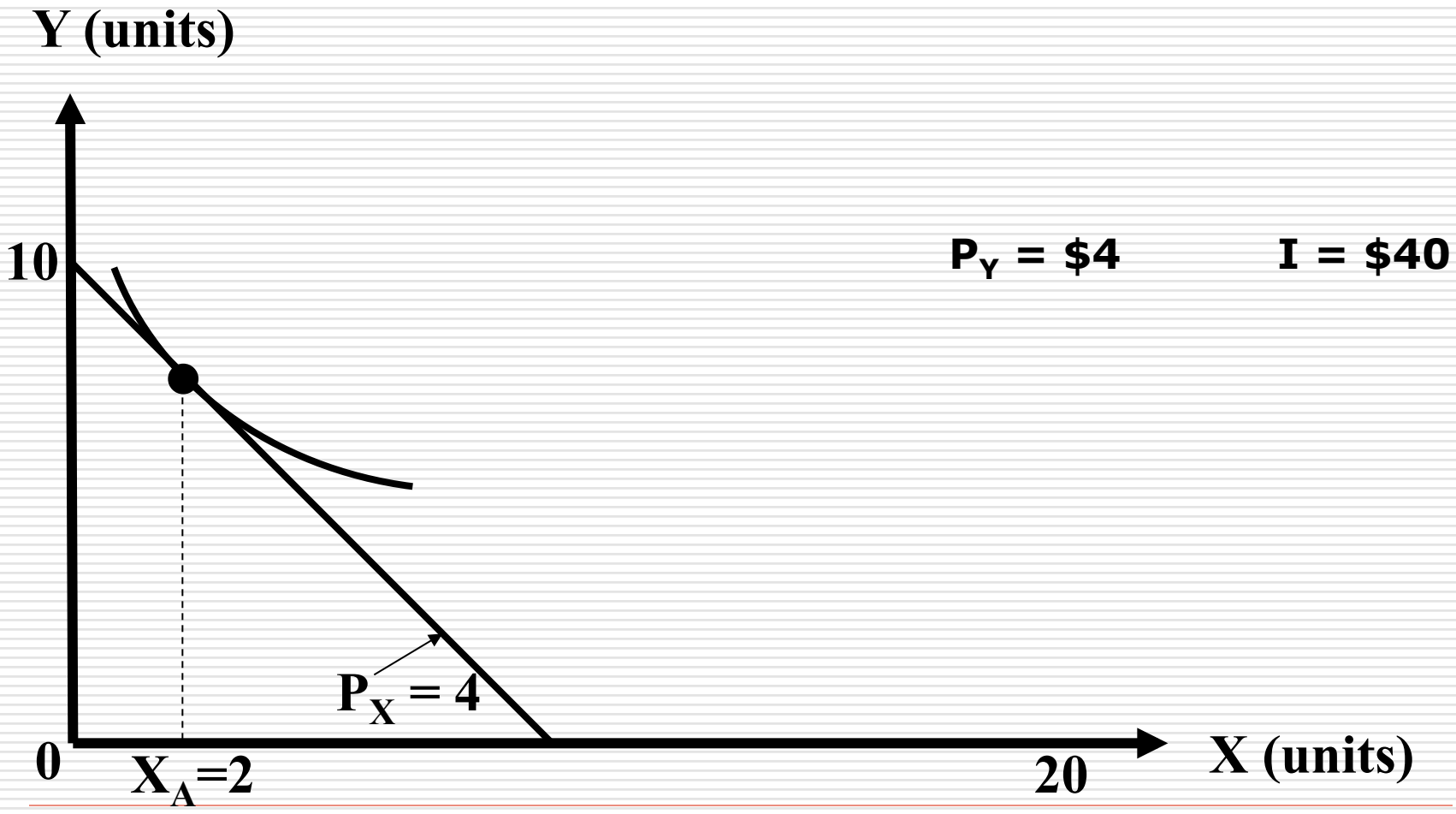
Example
Corner Consumer Optimum



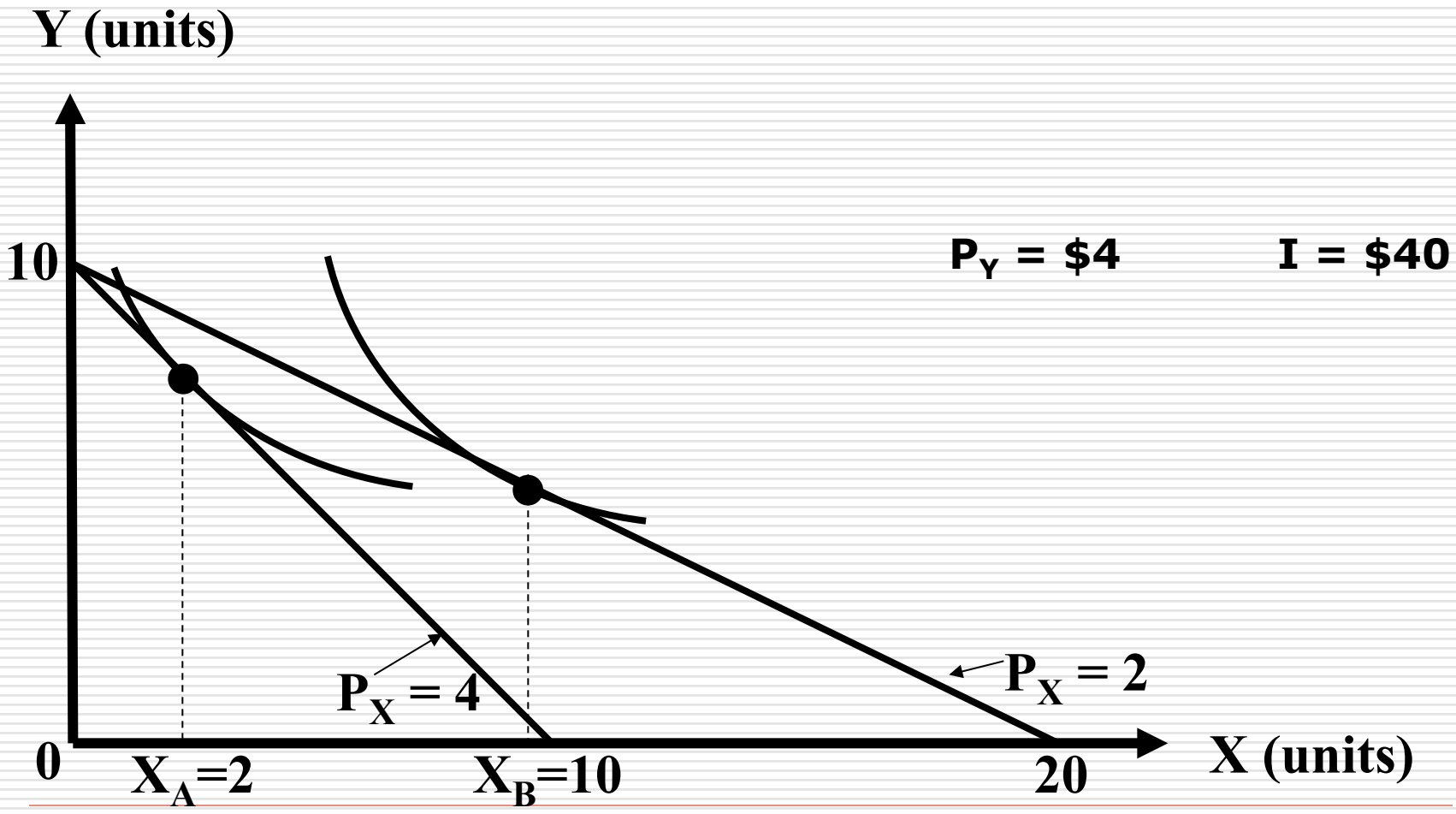
Individual Demand Curves

The **price consumption curve of good x** is the set of optimal baskets for every possible price of good x, holding all other prices and income constant

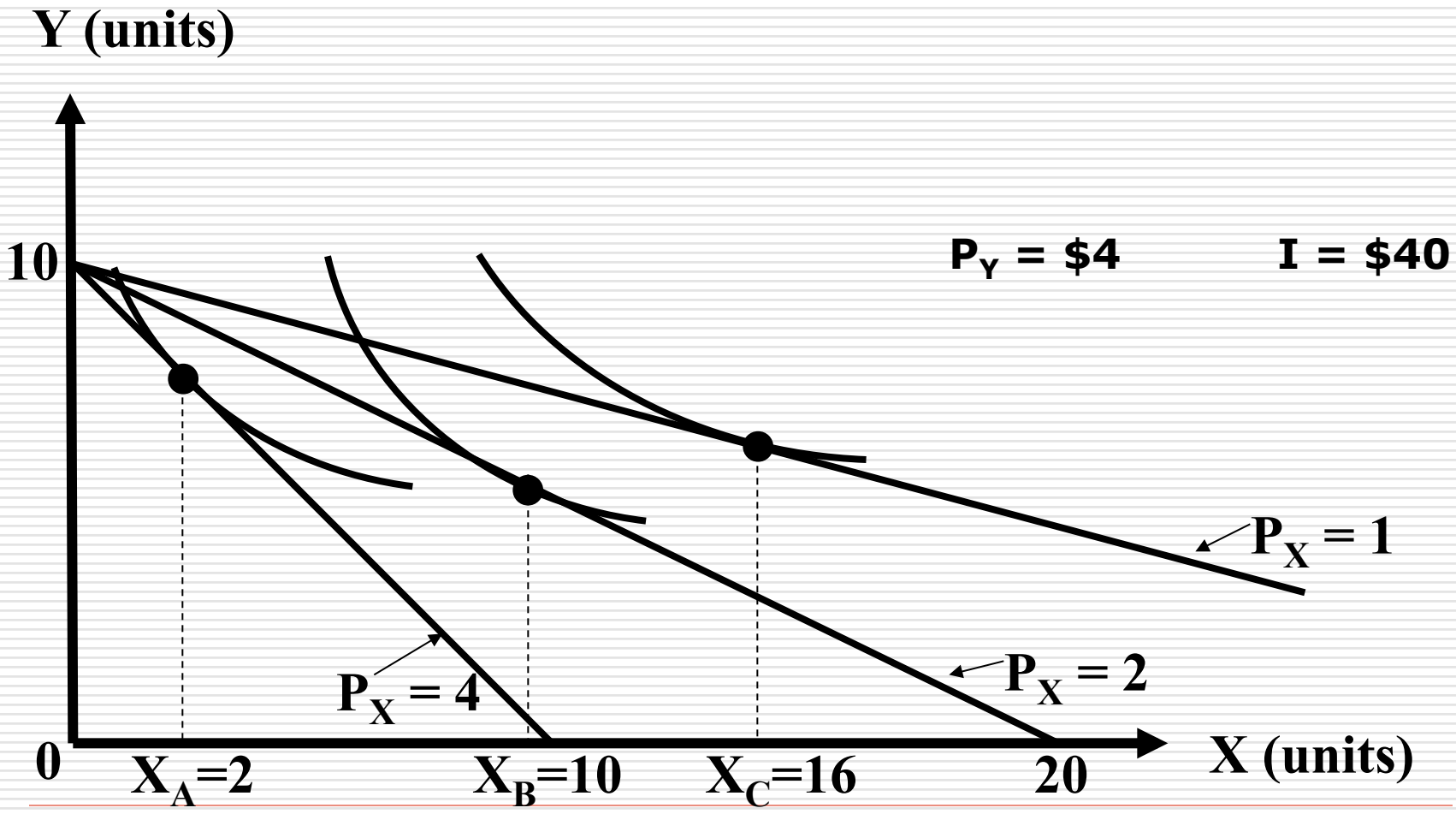
Example
A Price Consumption Curve



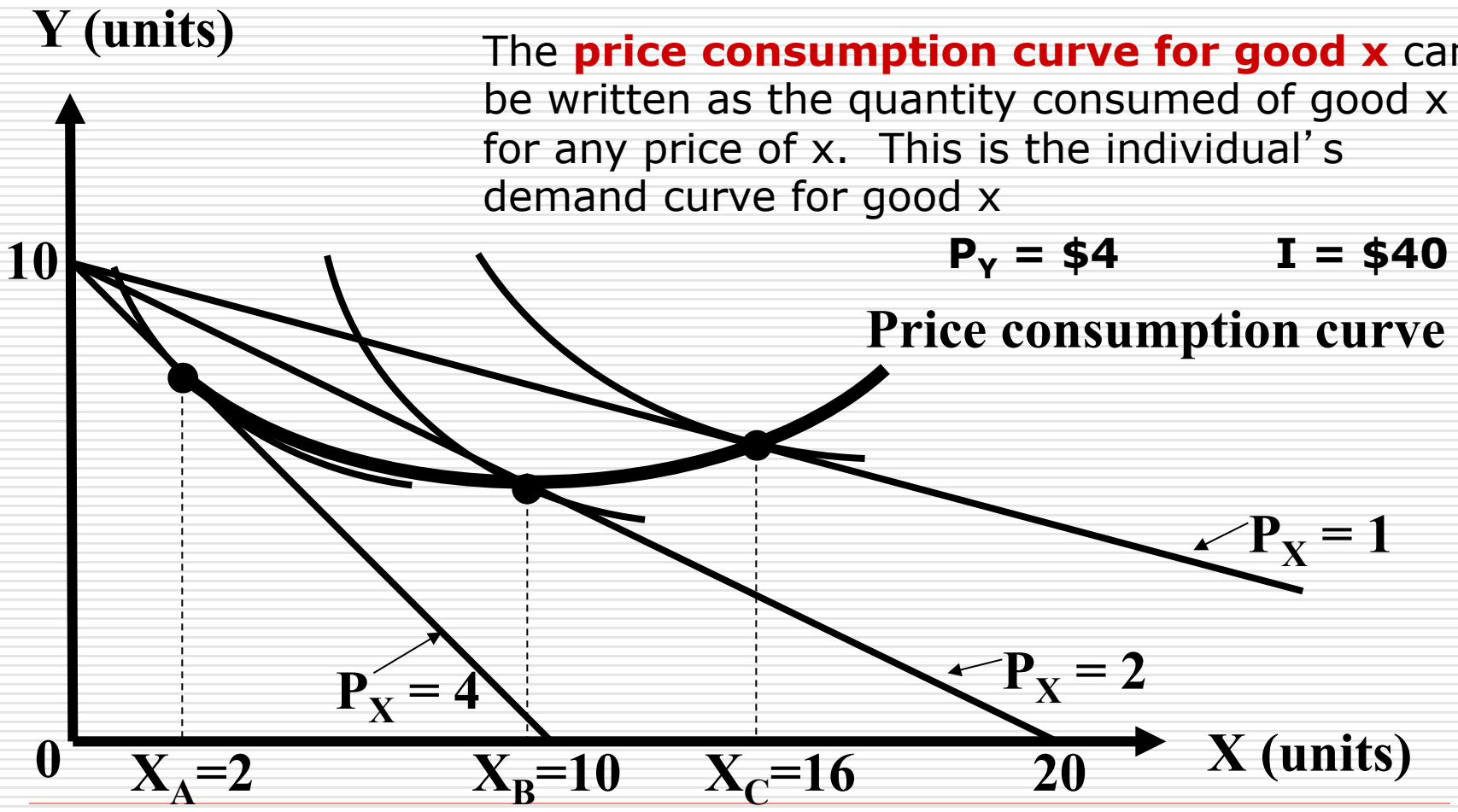
Example
A Price Consumption Curve



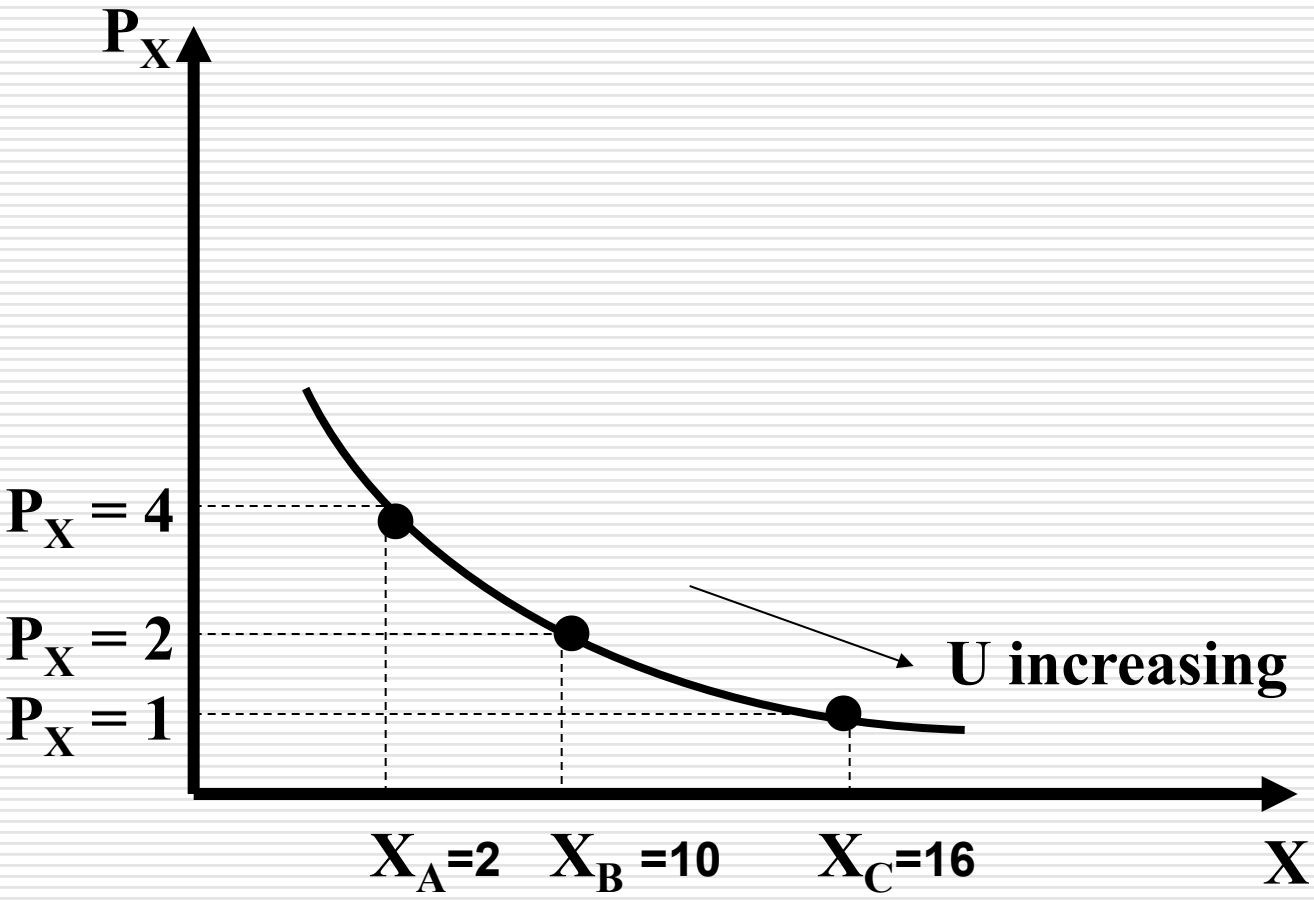
Example
A Price Consumption Curve



Example
A Price Consumption Curve



Example
Individual Demand Curve



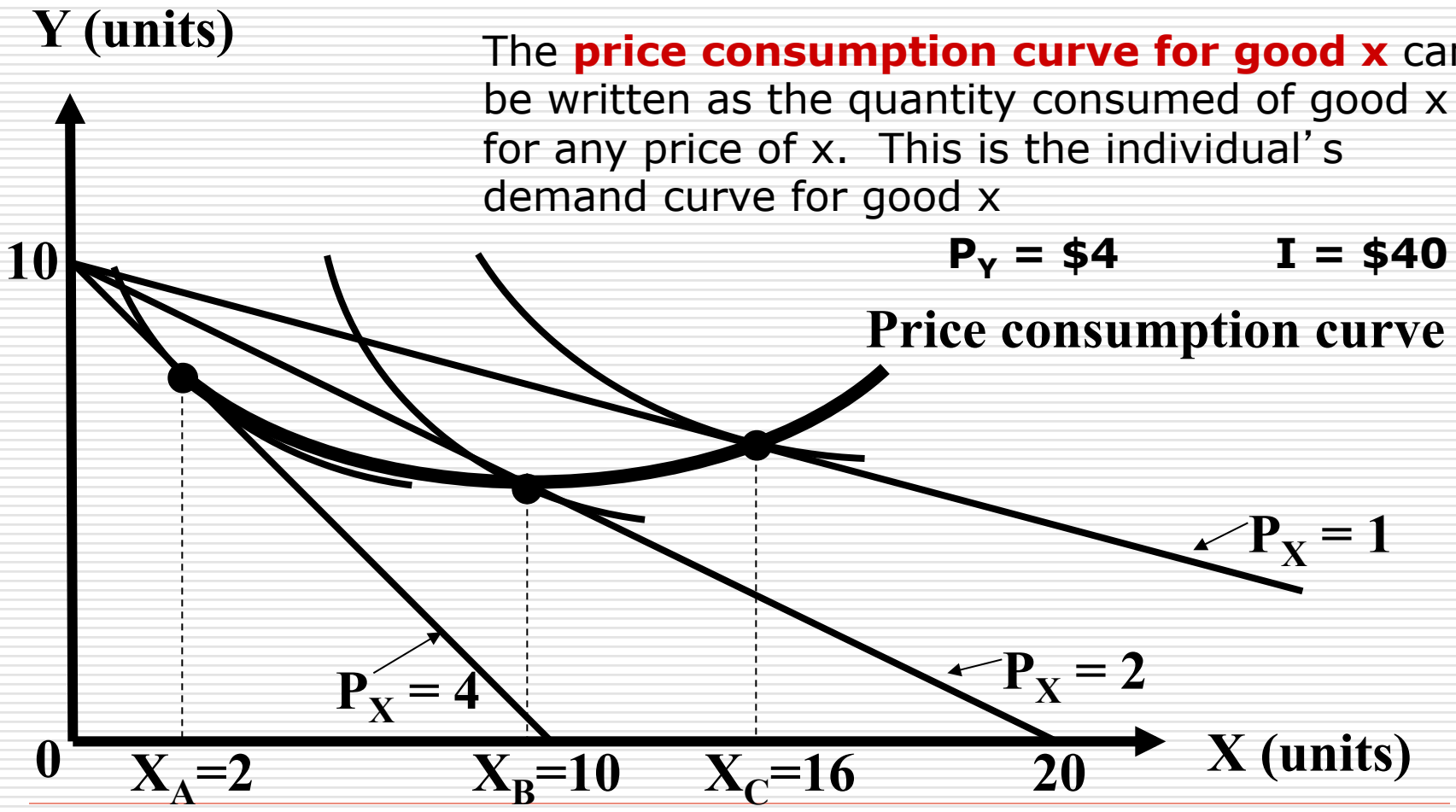
Note:

The consumer is maximizing utility at every point along the demand curve

The marginal rate of substitution falls along the demand curve as the price of x falls (if there was an interior solution).

As the price of x falls, utility increases along the demand curve.

Remember…
A Price Consumption Curve

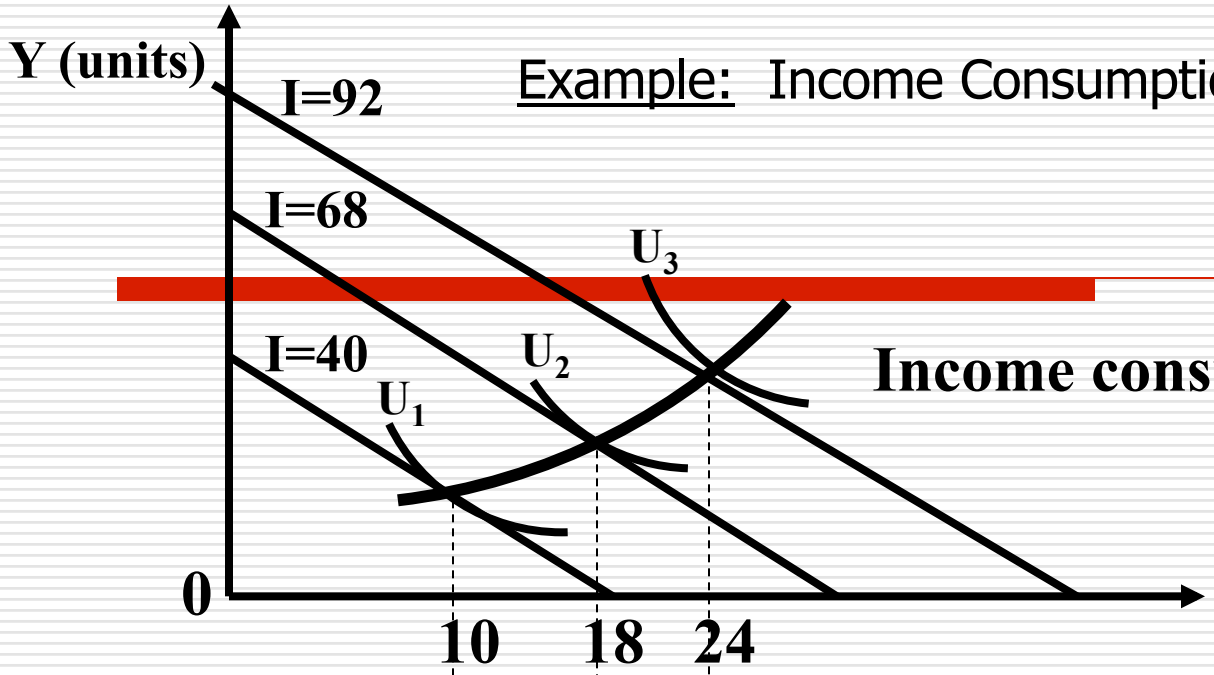


The **price consumption curve for good x** can be written as the quantity consumed of good x for any price of x. This is the individual's demand curve for good x

Income Consumption Curve

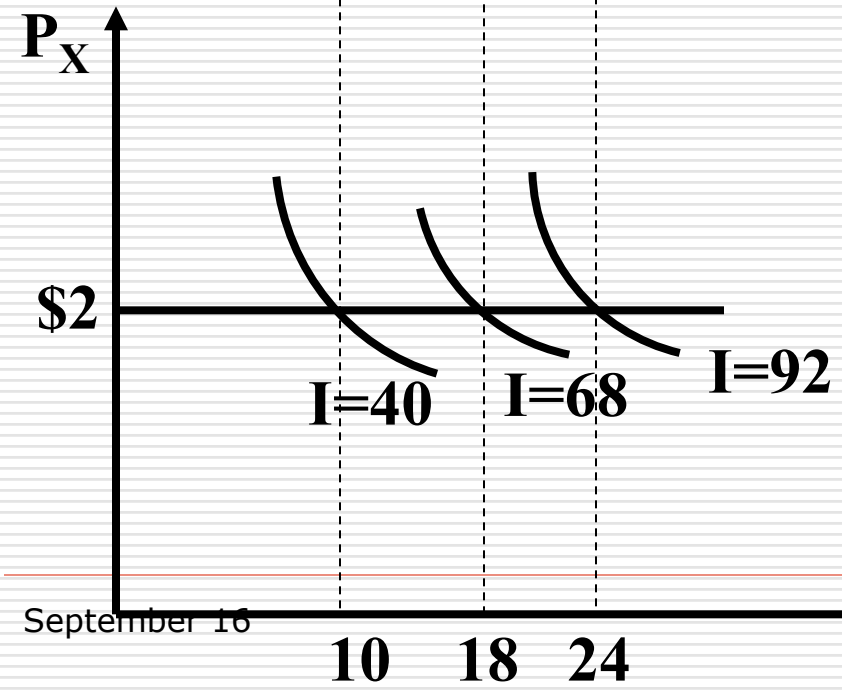
The income consumption curve of good x is the set of optimal baskets for every possible level of income.

We can graph the points on the income consumption curve as points on a shifting demand curve.

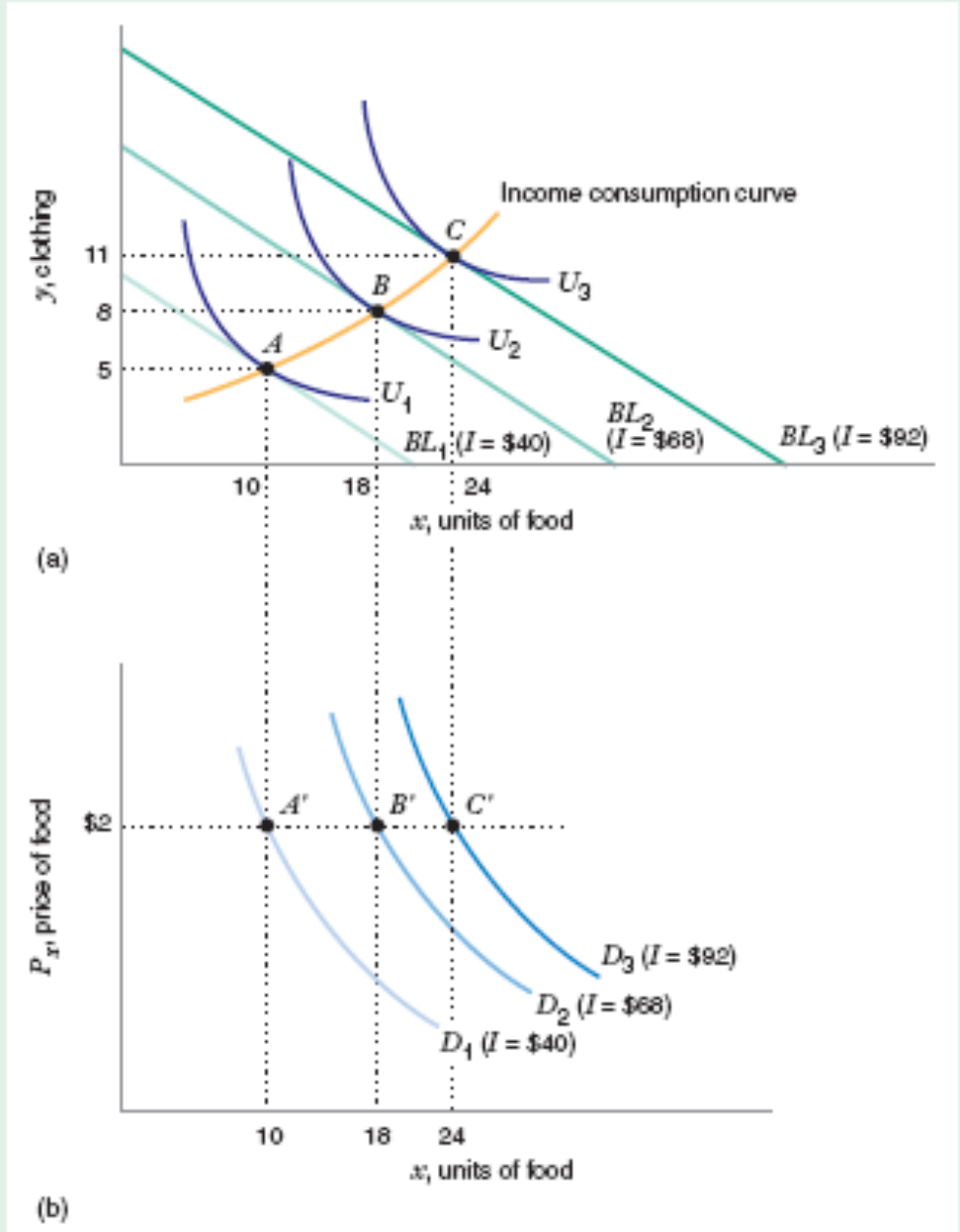


Example: Income Consumption Curve

Income consumption curve



The consumer's demand curve for X shifts out as income rises


y, clothing
11
8
5
Income consumption curve
C
B
A
U_3
U_2
U_1
BL_1 (I = \$40)
BL_2 (I = \$68)
BL_3 (I = \$92)
10
18
24
x, units of food
(a)
P_x, price of food
\$2
A'
B'
C'
D_3 (I = \$92)
D_2 (I = \$68)
D_1 (I = \$40)
10
18
24
x, units of food
(b)

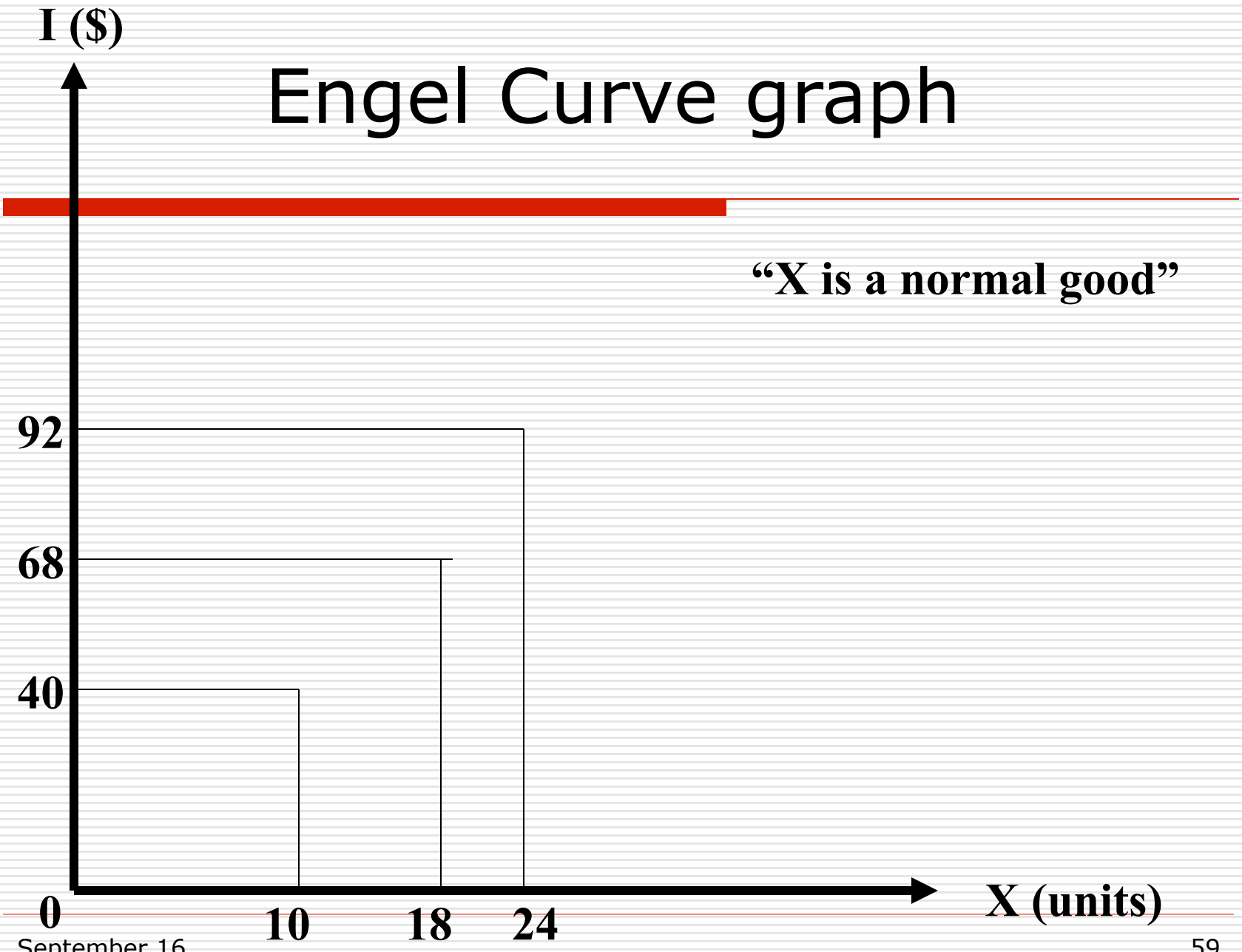
Engel Curves

The income consumption curve for good x also can be written as the quantity consumed of good x for any income level.

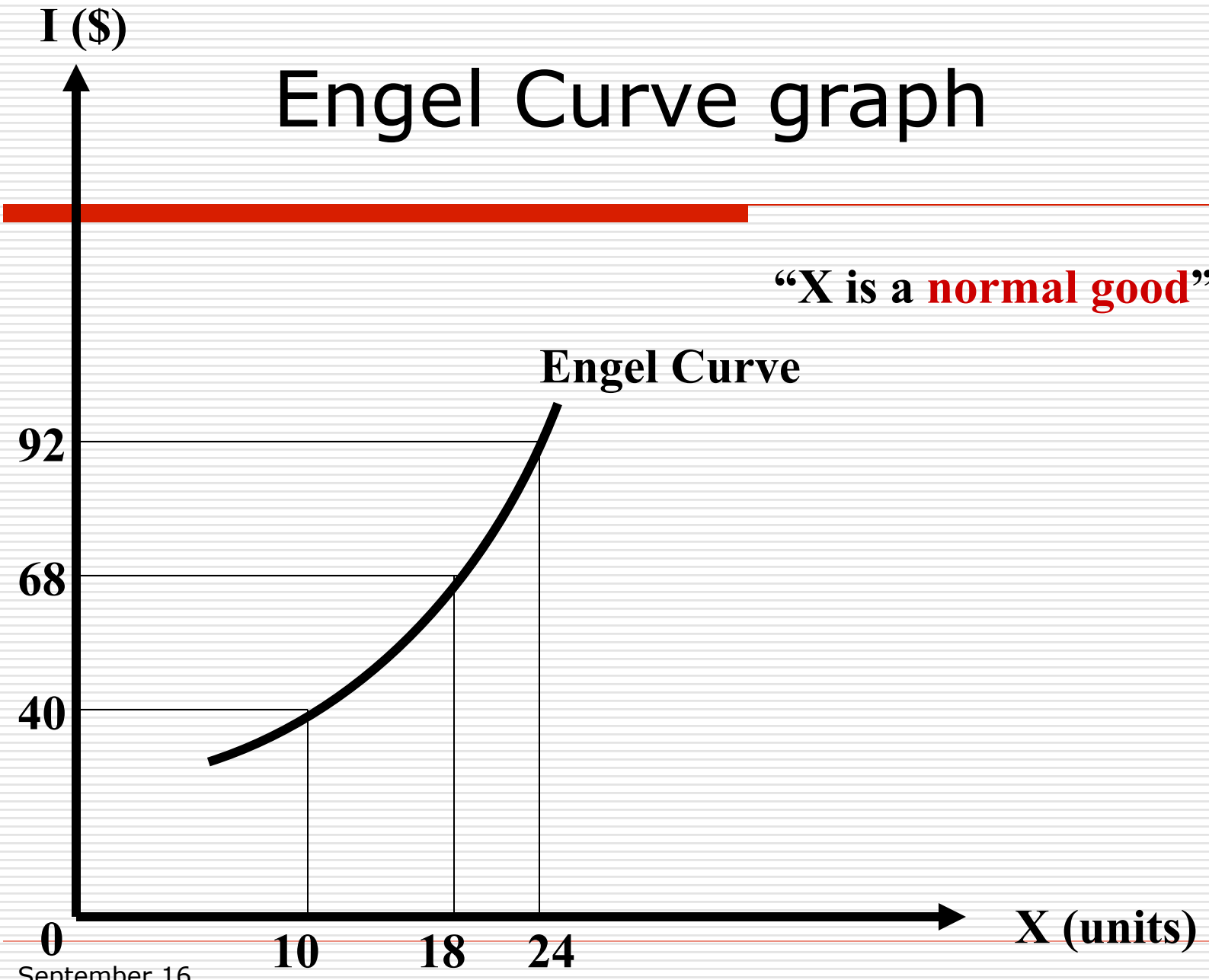
This is the individual's Engel Curve for good x.

When the income consumption curve is positively sloped, the slope of the Engel curve is positive.

Engel Curve graph

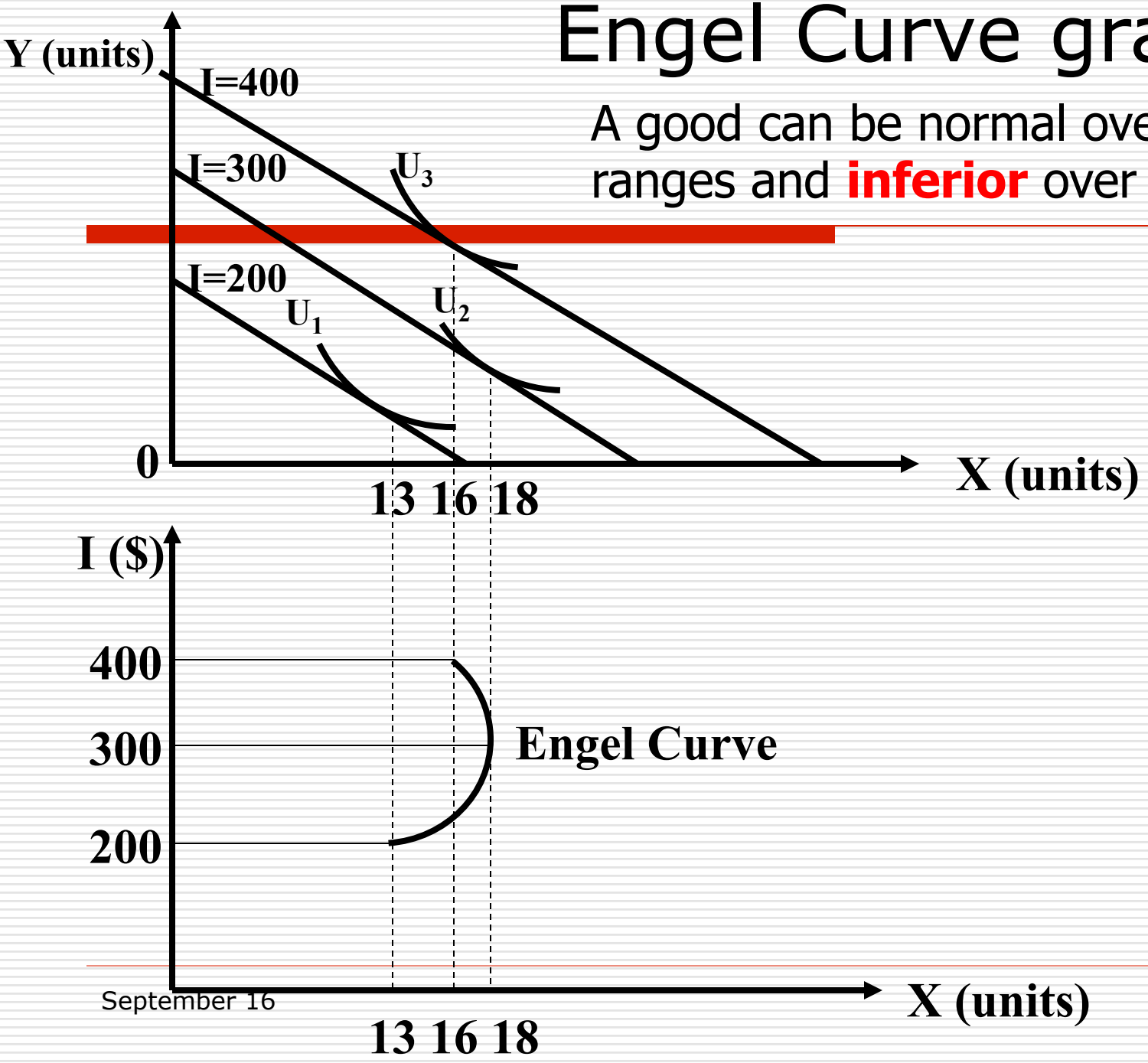


Engel Curve graph



Engel Curve graph

A good can be normal over some ranges and **inferior** over others



Definitions of good

- If the income consumption curve shows that the consumer purchases more of good x as her income rises, good x is a **normal** good.
    - Equivalently, if the slope of the Engel curve is positive, the good is a normal good.

- If the income consumption curve shows that the consumer purchases less of good x as her income rises, good x is an **inferior** good.
    - Equivalently, if the slope of the Engel curve is negative, the good is an inferior good.

How does a change in price affect the individual demand?

- So far, we have used a graphical approach.

- Here, we refine our analysis by breaking this effect down into two components:

  - **A substitution effect**
  - **An income effect**

Substitution effect

As the price of x falls, all else constant, good x becomes cheaper *relative* to good y. This change in relative prices *alone* causes the consumer to adjust his/ her consumption basket. This effect is called the **substitution effect.**

- Always negative if the price rises
- Always positive if the price falls

Income effect

• Definition: As the price of x falls, all else constant, purchasing power rises. This is called the **income effect** of a change in price.

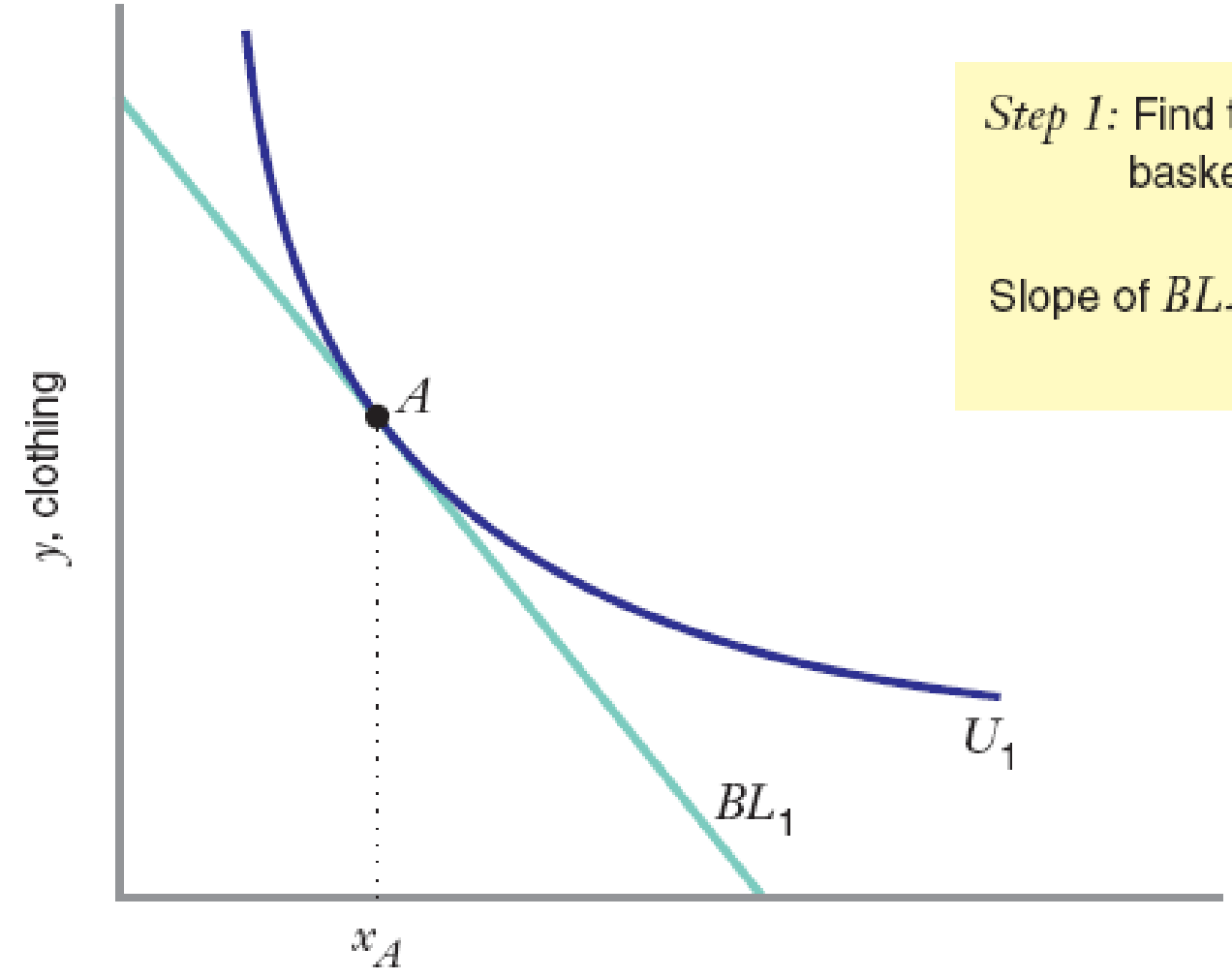
⇨ *The income effect may be positive (normal good) or negative (inferior good).*

Substitution + Income effects

Usually, a move *along* a demand curve will be composed of both effects.

- *Graphically, these effects can be distinguished as follows…*

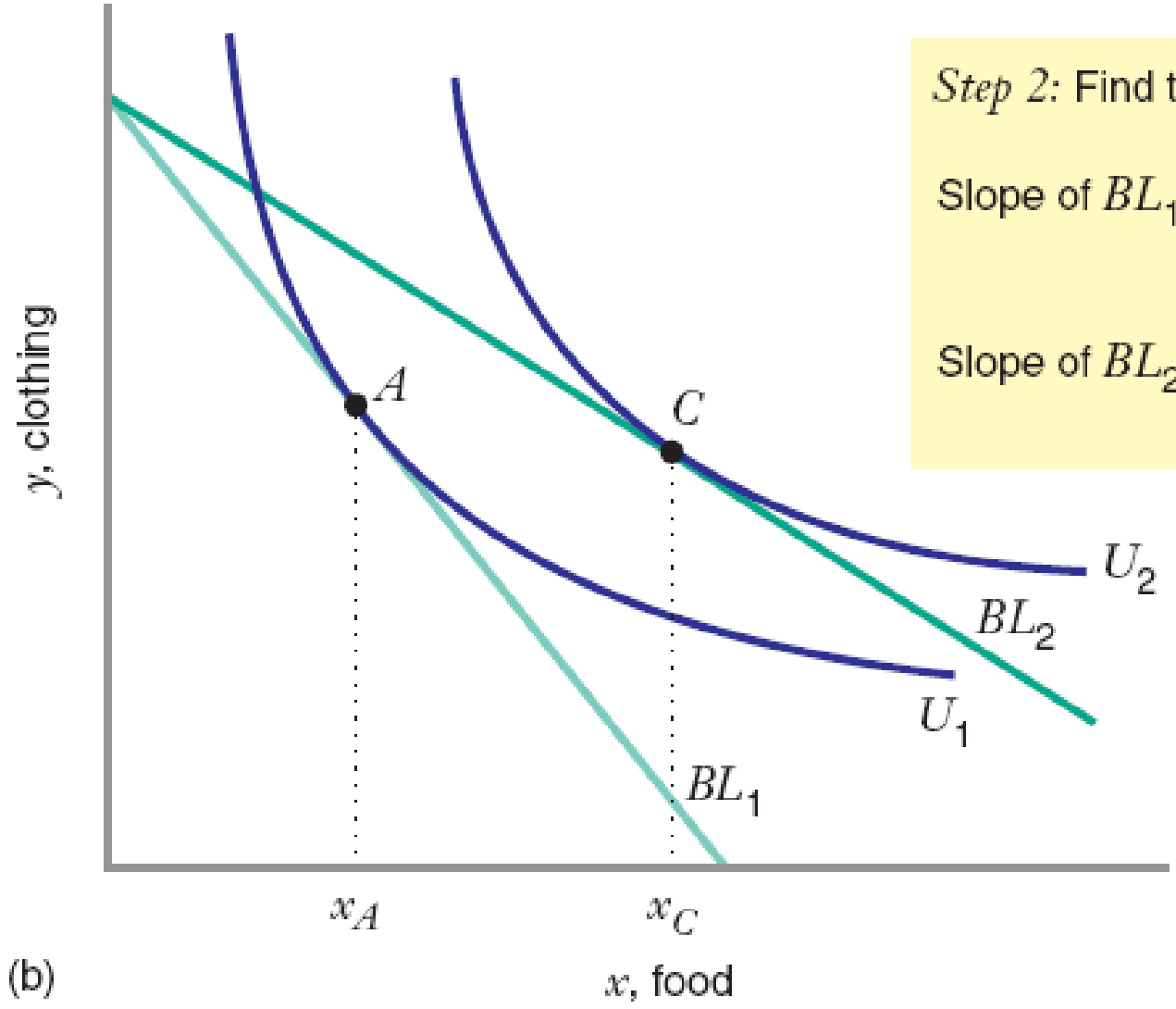
Example: **Normal Good**: Income and Substitution Effects



Step 1: Find the initial basket A.

Slope of $BL_1 = -\dfrac{P_{x_1}}{P_y}$

Example: **Normal Good**: Income and Substitution Effects

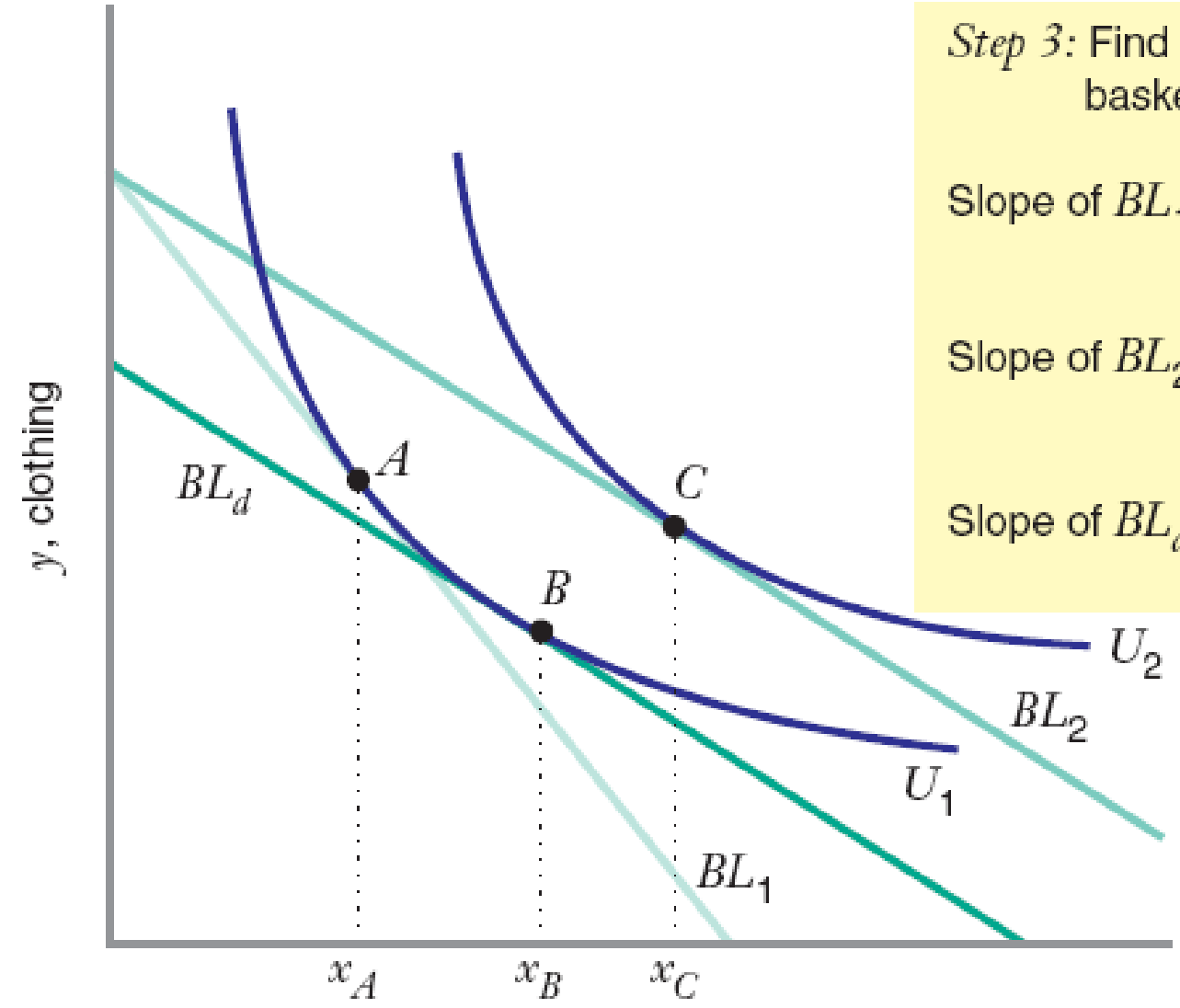


Step 2: Find the final basket C.

Slope of $BL_1 = -\dfrac{P_{x_1}}{P_y}$

Slope of $BL_2 = -\dfrac{P_{x_2}}{P_y}$

Example: **Normal Good:** Income and Substitution Effects



(c)

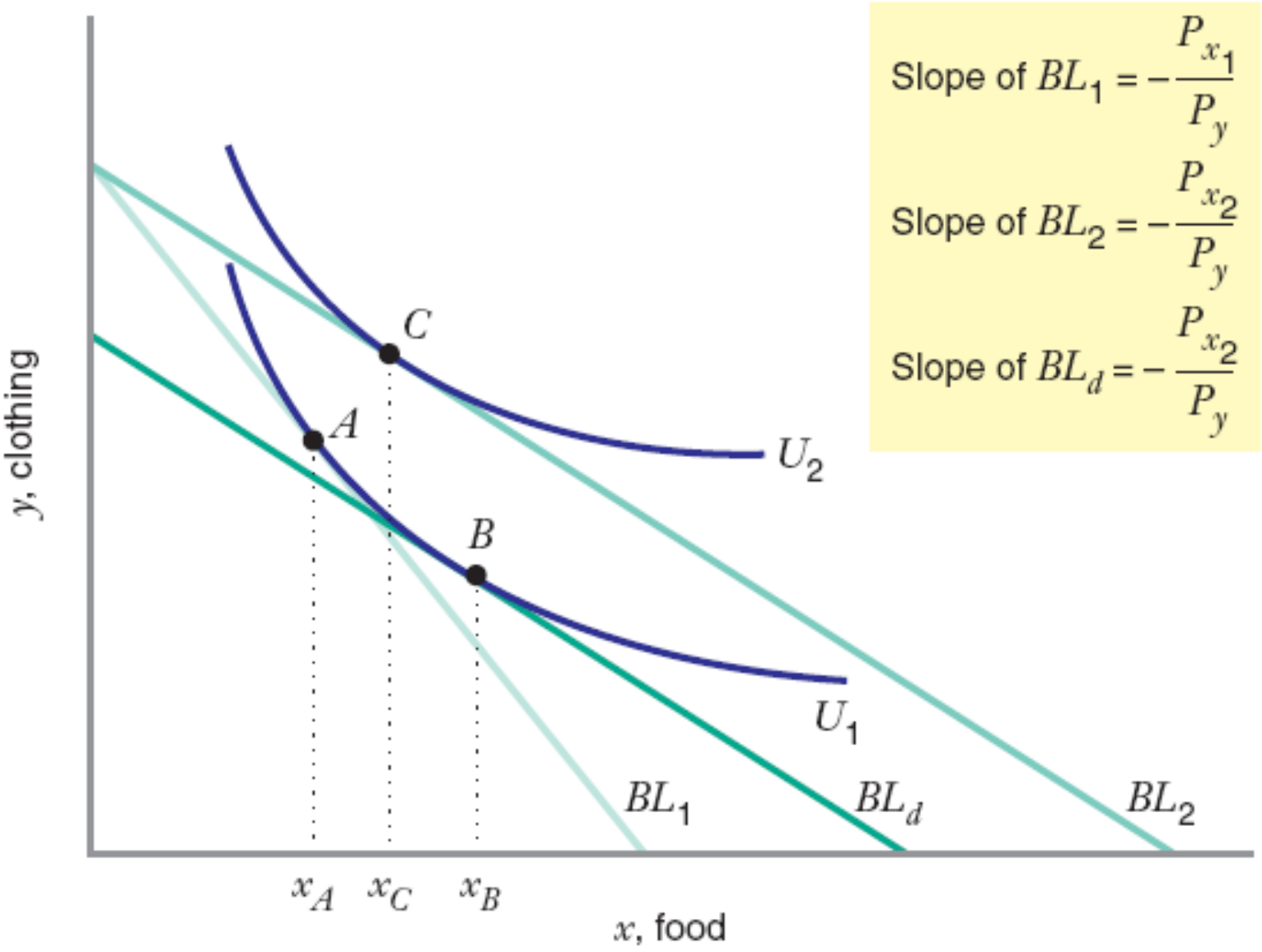
Step 3: Find the decomposition basket B.

Slope of $BL_1 = -\dfrac{P_{x_1}}{P_y}$

Slope of $BL_2 = -\dfrac{P_{x_2}}{P_y}$

Slope of $BL_d = -\dfrac{P_{x_2}}{P_y}$

Example: **Inferior Good**: Income and Substitution Effects



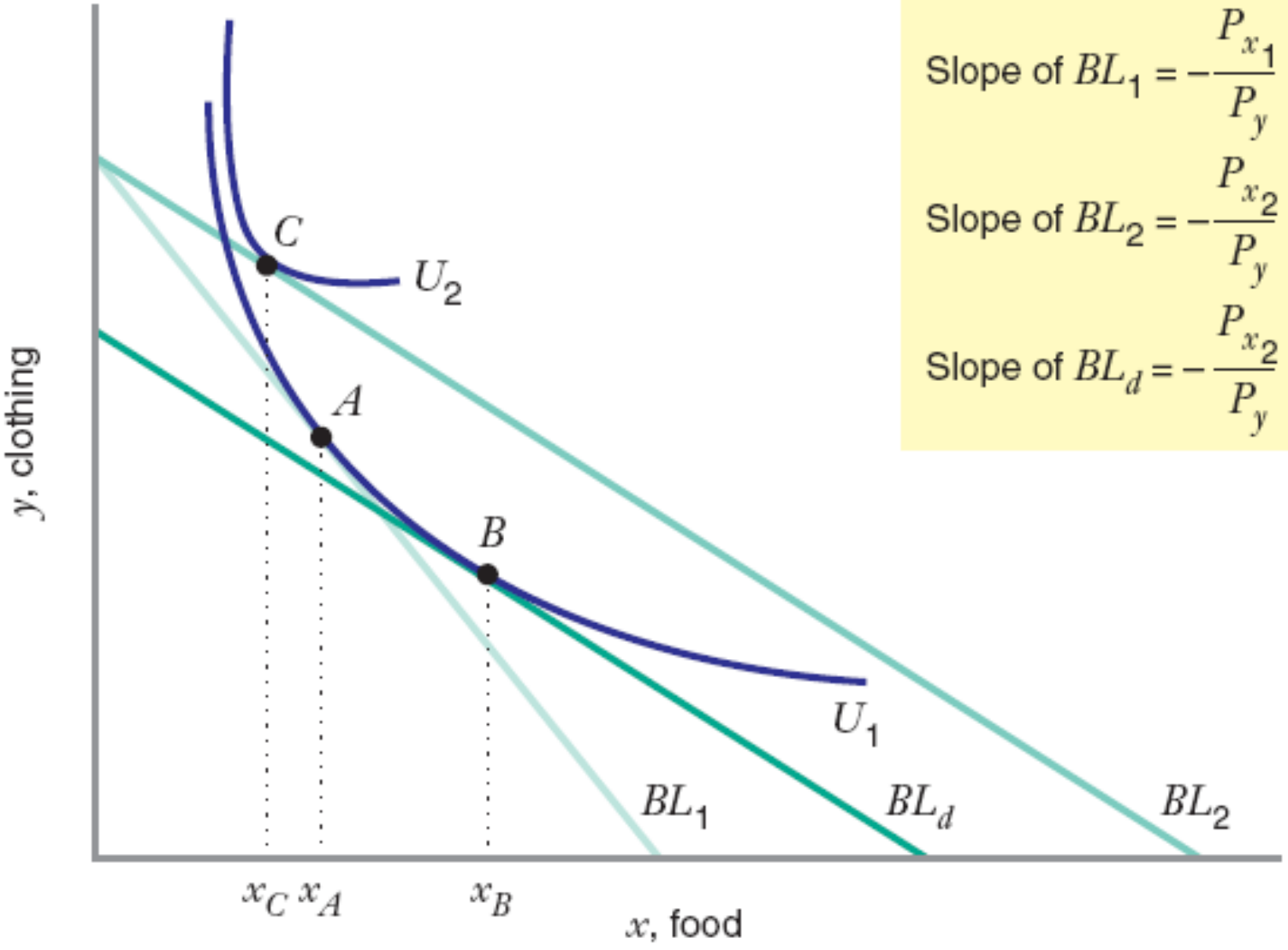
If a good is so inferior that the net effect of a price *decrease* of good x, all else constant, is a *decrease* in consumption of good x, good x is a **Giffen good**.

- For Giffen goods, demand does not slope down.

- When might an income effect be large enough to offset the substitution effect? The good would have to represent a very large proportion of the budget.

Example: Giffen Good: Income and Substitution Effects

Example: **Giffen Good**: Income and Substitution Effects



Aggregate Demand

The market, or aggregate, demand function is the horizontal sum of the individual demands.

In other words, market demand is obtained by adding the quantities demanded by the individuals (or segments) at each price and plotting this total quantity for all possible prices.

Network externalities

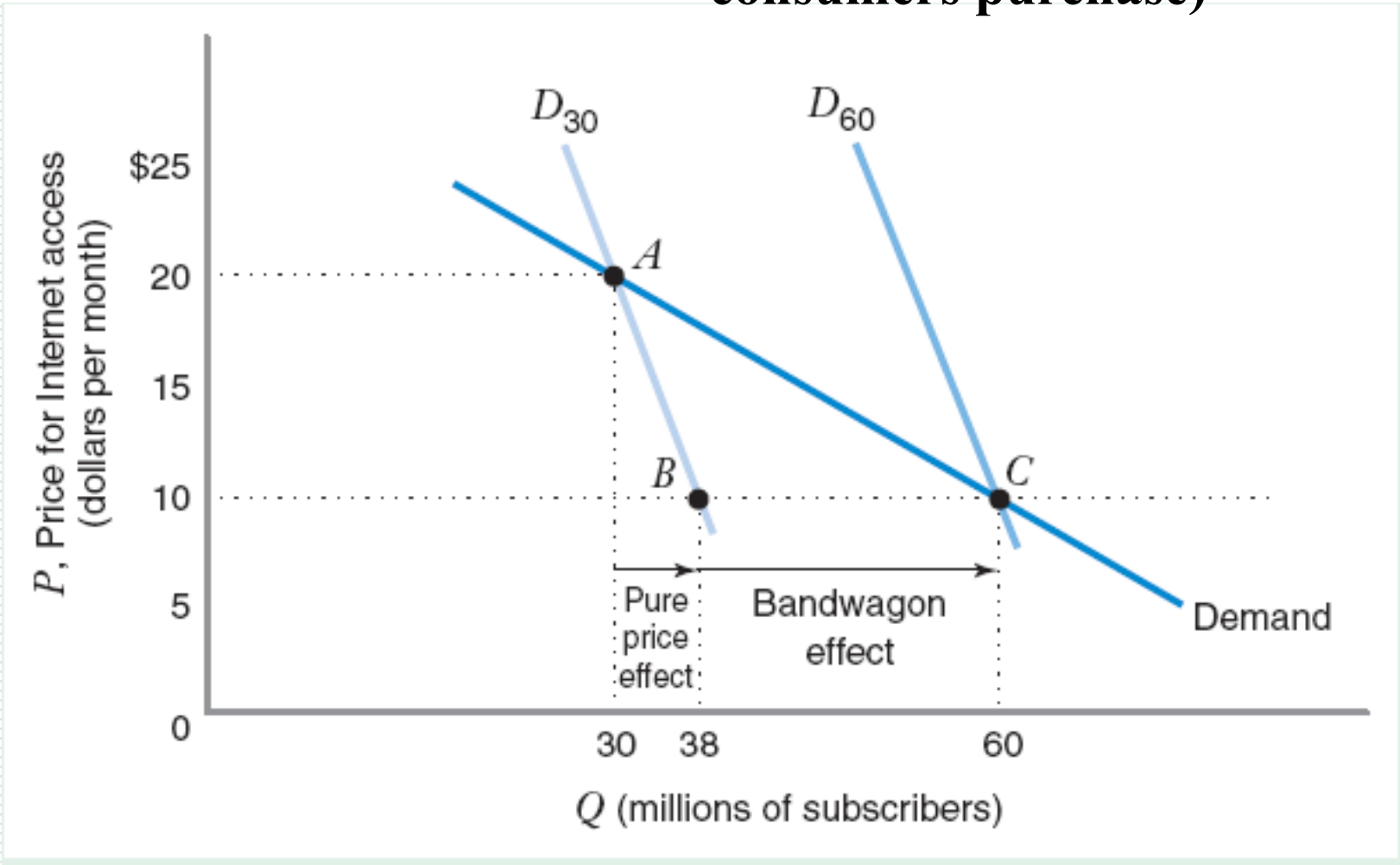
If one consumer's demand for a good changes with the number of other consumers who buy the good, there are **network externalities**.

- If one consumer's demand for a good increases with the number of other consumers who buy the good, the externality is *positive.*

- If the amount a consumer demands increases when fewer other consumers have the good, the externality is *negative.*

Example: The Bandwagon Effect

Bandwagon Effect (increased quantity demanded when more consumers purchase)



The Snob Effect

Snob Effect (decreased quantity demanded when more consumers purchase)