EC2101
MICROECONOMIC ANALYSIS I

Semester 2 AY 2021/2022

Dr. Zhang Yang

LECTURE 1

COURSE OVERVIEW
CONSTRAINED OPTIMIZATION
PREFERENCE

Part 1

Course Overview

Learning Outcomes

- Identify key concepts and principles in microeconomics
- Solve economic models using graphical and mathematical tools
  - Math required: algebra, calculus
- Interpret the results and analyze the policy implications of models

What is Microeconomics?

- Microeconomics studies how individual economic units make decisions
  - Individual economic units
    - consumers, households, workers, firms, etc.
  - Assuming individual economic units are rational
  - When facing limited resources

Basic Information

- Lectures
  - Recorded e-lectures + live sessions on Zoom
- Tutorials
  - Weekly e-tutorials on Zoom
- Consultations
  - Wednesday 4:30 pm – 6:30 pm
  - Thursday 10:30 am – 12:30 pm
  - Or by appointment
- Contact
  - AS2-04-36, 6516-6830, zhangyang@nus.edu.sg

Reading

- Textbook
  - Besanko and Braeutigam, *Microeconomics*, 6th edition (international student version), Wiley, 2020 (BB)
  - The 4th and 5th edition of the book are also acceptable
  - Solutions to textbook exercises
    - Will not be distributed
- Slides
  - For e-lectures: available on LumiNUS every Monday by 10:00 am
  - For live sessions: available on LumiNUS every Thursday after the live session

Tentative Course Outline

- Part 1 Consumer Theory
  - Week 1-4, BB: Chapter 3-5
- Part 2 Exchange (General Competitive Equilibrium)
  - Week 5-6, BB: Chapter 16 + additional reading on LumiNUS
- Part 3 Production and Costs
  - Week 8-10, BB: Chapter 6-8
- Part 4 Competitive Markets
  - Week 11-13, BB: Chapter 9-10

EC2101 and EC1101E/EC1301

- EC1101E/EC1301
  - Introductory level
  - Focus on knowing basic concepts
  - Limited mathematics
- EC2101
  - Intermediate level
  - Focus on solving and understanding economic models
  - Uses calculus

Lectures and Live Sessions

- E-lectures
  - Available on LumiNUS every Monday by 10 am
- Live sessions
  - Group 1: Wednesday 4 pm to 4:30 pm
  - Group 2: Thursday 10 am to 10:30 am
  - No new concept, follow-up on e-lectures
  - In-class exercises + Q&A
    - Participate via Poll Everywhere
  - Watch the e-lecture before attending the live session
  - Will be recorded

Consultations

- Open consultation
  - Wednesday 4:30 pm to 5:30 pm
  - Thursday 10:30 am to 11:30 am
  - No appointment needed
  - Held on Zoom
- Consultation by appointment
  - Wednesday 5:30 pm to 6:30 pm
  - Thursday 11:30 am to 12:30 pm
  - Sign up for consultation on LumiNUS
    - Always choose individual consultation
  - Can be on Zoom or in person

Grading

- Post-Lecture Quiz 10%
- Tutorial Participation 10%
- Tutorial Submission 10%
- Midterm 25%
- Final 45%

Post-Lecture Quiz

- There are 12 graded quizzes
  - The quiz on calculus is optional and not graded
- Each quiz contains a few multiple-choice questions
- The quizzes test your understanding of the e-lectures
- Grading
  - 2 attempts allowed for each quiz
  - For each quiz, the better attempt will be recorded
  - The best 10 quizzes will count towards your grade
  - No extension of deadline

Tutorials and Practice Problems

- Zoom tutorials start from week 3
  - No tutorial in week 7 (midterm week)
- Practice problems will be assigned after each lecture
  - Starting from week 2
- Solutions to practice problems discussed in tutorials
  - Students present the solutions by sharing screens and explaining
  - Written solutions will be posted on LumiNUS
- Additional questions will be discussed
  - Solution will not be posted on LumiNUS

Tutorials and Practice Problems Cont’

- Turn on your video in tutorials
  - Failure to do so may affect your participation mark
- Feel free to use virtual backgrounds
- Tutorials will not be recorded

Grading of Tutorial Participation

- Participation graded by tutorial presentations and general participation in tutorials
- Presentation (5%)
  - Each student presents once (only the first presentation will be graded)
  - Graded based on effort
    - Not on correctness
- General participation (5%)
  - Attendance
  - Participation in tutorial discussions
  - Volunteer to present more than once

A Few Words on Presentations

- Students volunteer for presentations
  - Your tutor may call someone to present if no one volunteers
- How to present?
  - You need to explain!
  - When you present, you are the teacher and you are responsible for your classmates' learning

Tutorial Submission

- Each group submits solutions to the practice problems twice
  - Starting from practice problems 2
  - Each submission is worth 5%
- Each submission should contain two parts
  - Part 1: solutions to the practice problems
  - Part 2: answers to the reflection question
    - Reflection question: what have you learned from this question?
- Submit to LumiNUS Files by the day before the tutorial
  - No late submission
  - Graded based on effort

Tutorial Submission Groups

- In general, tutorial submission should be done in group
- Form a group of 2-3 with your classmates from the same tutorial
- If you really do not want to work in a group
  - You have the option of doing individual submission
- Let you tutor know your choice and group members by tutorial 2 (week 4)
- Be a responsible group member!!!

Weekly Timeline

Monday

- E-lecture available by 10 am
- Post-lecture quiz opens at 10 am
- Practice problems available

Wednesday & Thursday

- Live session group 1 on Wednesday
- Live session group 2 on Thursday
- Consultations

Sunday

- Post-lecture quiz closes at 23:59 pm

Exams

- Exams are planned to be in-person
  - No online option for students who choose to stay overseas
- Midterm
  - 3 March evening
  - Makeup midterm offered to students with conflicting schedules
    - 2 March and/or 3 March at regular lecture hours
    - Need to register for makeup midterm in advance
- Final
  - 28 April 9:00 am to 11:00 am
  - No makeup final will be offered

Use of LumiNUS

- Announcement
- Consultation
- Files
- Gradebook
- Multimedia
  - Videos on calculus
  - E-lectures
  - Recordings of live sessions
- Quiz
  - Post-lecture quizzes

Other E-Learning Tools

- Zoom
  - Your Zoom name should be the same as your name on your student card
    - Change your Zoom name on the NUS Zoom website
  - You will be asked to sign in with your NUS account every time you join the Zoom meeting
- Poll Everywhere
  - pollev.com/jamesbond
- Microsoft Teams
  - Use Teams to collaborate with your group mates
  - Teams may be used for tutorial activities
- Scanning app

A Few More Things

- Attendance of tutorials
  - Will be taken
  - Inform your tutor if you have to miss a tutorial and try to go for a makeup
- Past-year questions and questions from other sources
  - Will not be discussed
- Intellectual property
  - You are not allowed to distribute or sell any teaching materials (including videos and audios) without permission
- Read the syllabus carefully

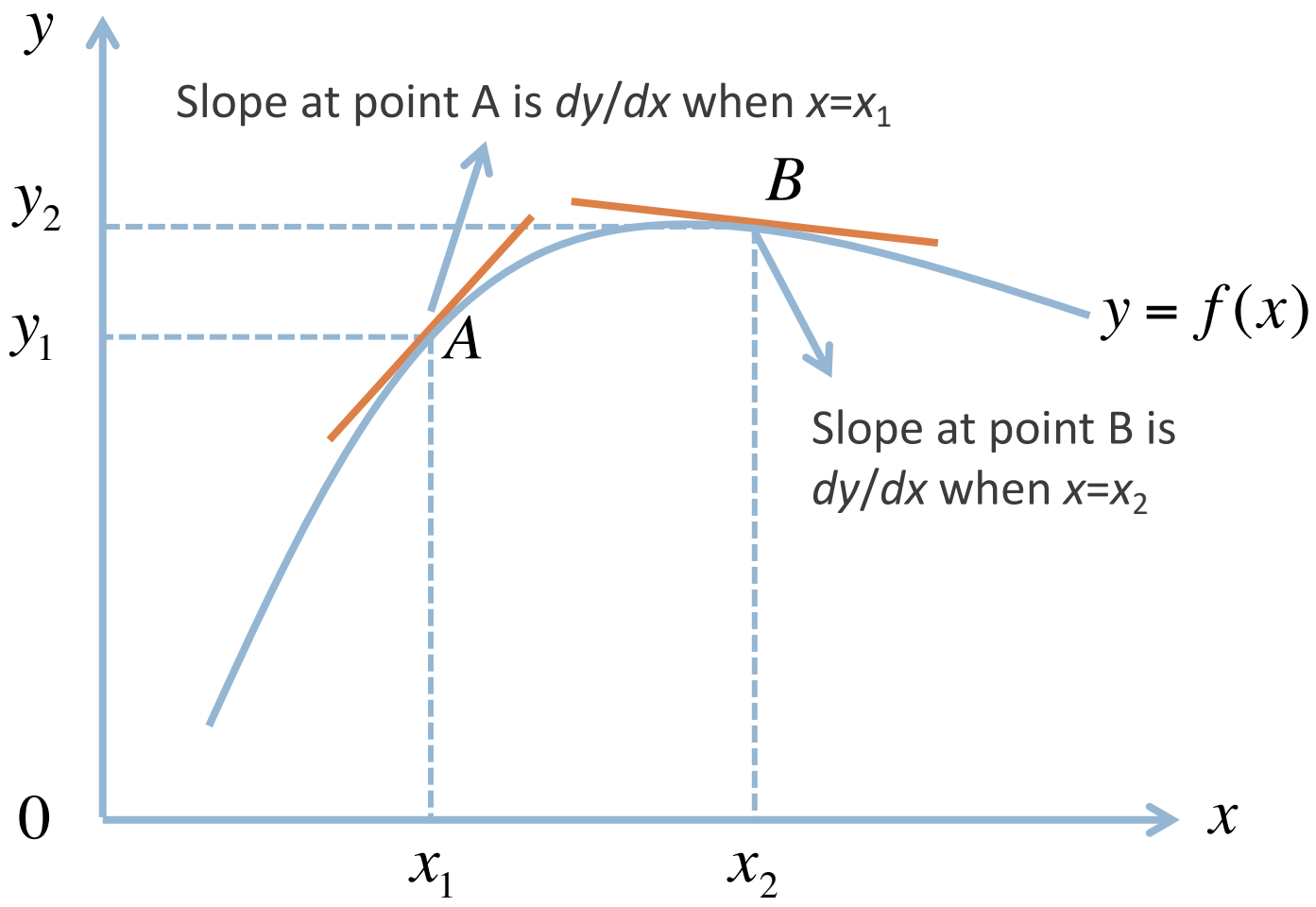
Public Holiday and Rescheduling

- 31 January (Monday)
  - Eve of Chinese New Year
  - No class after 2 pm (to be confirmed)
  - W5 to be rescheduled
- 1 February – 2 February (Tuesday and Wednesday)
  - Chinese New Year
  - W6-W16 to be rescheduled
- 14 April (Thursday)
  - W17-W20 to be rescheduled

Part 2

Constrained Optimization

Review: Derivative and Slope



Positive derivative: the curve is upward sloping

Negative derivative: the curve is downward sloping

Unconstrained Optimization with One Variable

- What is the maximum of the following function?

$$y = -x^2 + 2x + 10$$

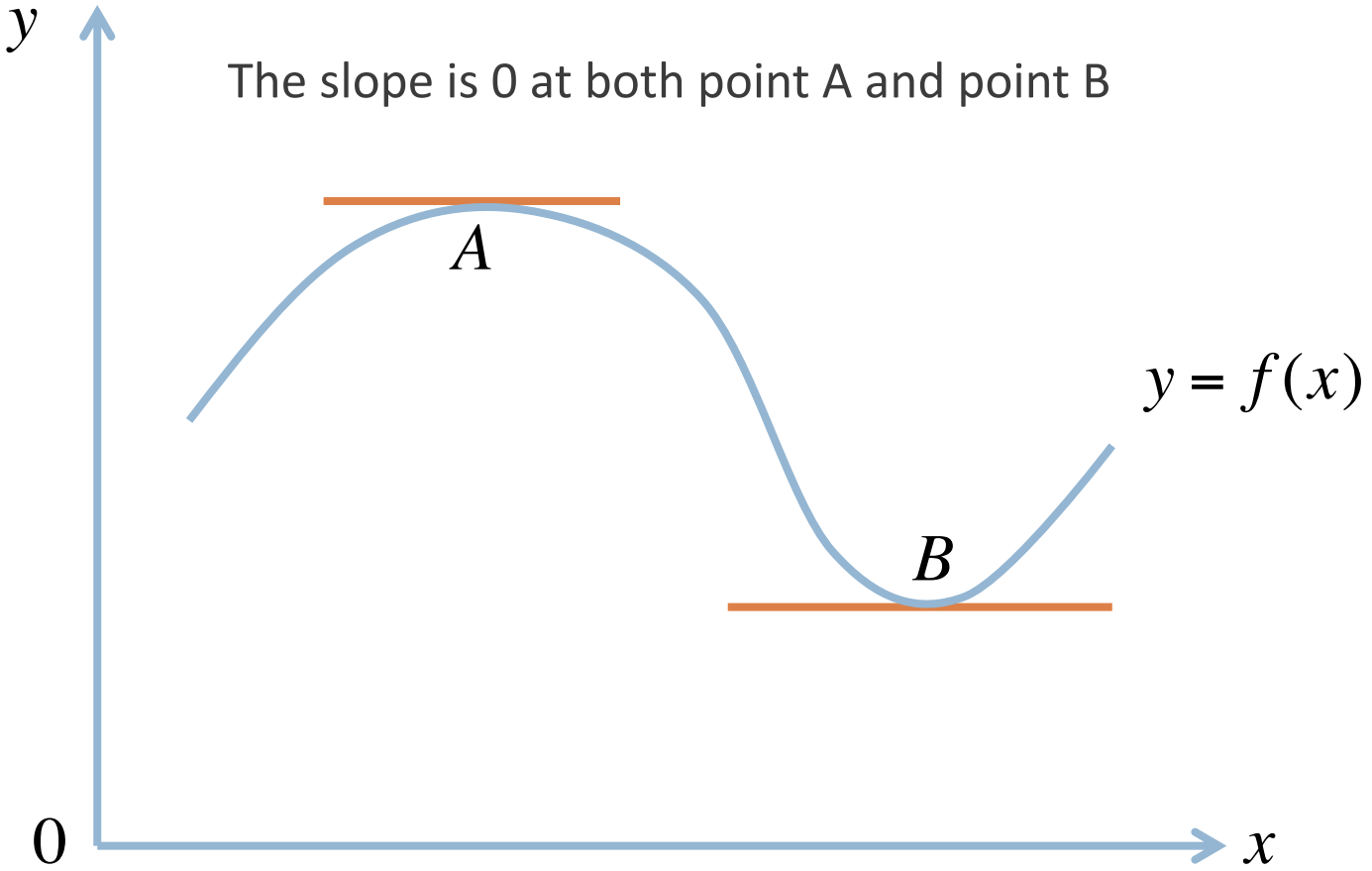
- At the maximum, the slope of the function must be 0 – *the first-order condition*

$$\frac{dy}{dx} = -2x + 2 = 0$$

- At the maximum, x=1
- The maximum value of y is 11

Maximum vs. Minimum

The slope is 0 at both point A and point B



Second-Order Condition

- At the maximum,

$$\frac{d^2y}{dx^2} \leq 0$$

- Using our earlier example,

$$\frac{d^2y}{dx^2} = \frac{d(-2x+2)}{dx} = -2$$

- At the minimum,

Unconstrained Optimization with Two Variables

- Suppose you want to find the maximum of

$$f(x,y) = -x^2 + 2x - y^2 + 4y + 5$$

- Same idea – two first-order conditions

$$\frac{\partial f}{\partial x} = -2x + 2 = 0$$

$$\frac{\partial f}{\partial y} = -2y + 4 = 0$$

- The function reaches its maximum when x=1 and y=2, and the maximum is 10

Constrained Optimization

- Suppose you still want to find the maximum of the same function
- However, now you need to satisfy another equation

$$x + y = 1$$

- This is a *constrained maximization* problem
  - The *objective function* is

$$f(x, y) = -x^2 + 2x - y^2 + 4y + 5$$

  - The *constraint* is

$$x + y = 1$$

Lagrange Multiplier Method

- We first rewrite the constraint as

$$1 - x - y = 0$$

- We then construct the *Lagrangian function*

$$\Lambda(x, y, \lambda) = -x^2 + 2x - y^2 + 4y + 5 + \lambda(1 - x - y)$$

- The new unknown λ is the *Lagrange multiplier*
- To find the solution to the constrained maximization problem, we just need to maximize the Lagrangian function

Lagrange Multiplier Method Cont'

- There are three first-order conditions,

$$\frac{\partial \Lambda}{\partial x} = -2x + 2 - \lambda = 0$$

$$\frac{\partial \Lambda}{\partial y} = -2y + 4 - \lambda = 0$$

$$\frac{\partial \Lambda}{\partial \lambda} = 1 - x - y = 0$$

- Solving for the three equations, we have

$$x = 0, \quad y = 1, \quad \lambda = 2$$

- The maximum value of the function is 8

General Form of the Lagrange Multiplier Method

- The constrained optimization problem is

$$\max_{x,y} \quad f(x,y)$$

$$s.t. \quad g(x,y) = 0$$

  - $f(x,y)$ is the objective function
  - $g(x,y)$ is the constraint
- The Lagrangian function is

$$\Lambda(x,y,\lambda) = f(x,y) + \lambda g(x,y)$$

General Form of the Lagrange Multiplier Method Cont'

- To find the maximum, we derive the first-order conditions

$$\frac{\partial \Lambda}{\partial x} = \frac{\partial f(x,y)}{\partial x} + \lambda \frac{\partial g(x,y)}{\partial x} = 0$$

$$\frac{\partial \Lambda}{\partial y} = \frac{\partial f(x,y)}{\partial y} + \lambda \frac{\partial g(x,y)}{\partial y} = 0$$

$$\frac{\partial \Lambda}{\partial \lambda} = g(x,y) = 0$$

- Use the three equations for the three unknowns

Part 3

Preference

Key Questions in Consumer Theory

- Consumer choice
  - How do consumers choose what to buy and how much to buy?
- Demand function
  - How do consumers' choices change with prices and income?
- Consumer welfare
  - How to measure the gain/loss to consumers when prices change?

Consumer Choice: How do consumers make decisions?

- Basic assumptions
  - Consumers are rational
    - Specifically, consumers maximize utility
  - Consumers face budget constraints
  - Consumers are fully informed
- What do consumers like?
  - Preference
- Prices and income
  - Budget constraint

Preference

- How do consumers rank two goods?
- Definition 1.1 A consumer *(strictly) prefers* A to B
  - If the consumer is more satisfied with A than with B
  - We use the notation $A \succ B$
- Definition 1.2 A consumer is *indifferent* between A and B
  - If the consumer is equally satisfied with A or B
  - We use the notation $A \approx B$

Consumption Basket

	Food	Clothing	All others
Basket 1	40 units	20 units	10 units
Basket 2	50 units	10 units	20 units
Basket 3	30 units	30 units	15 units

- For simplicity, assume a *consumption basket* consists of two goods
  - For example, food and clothing

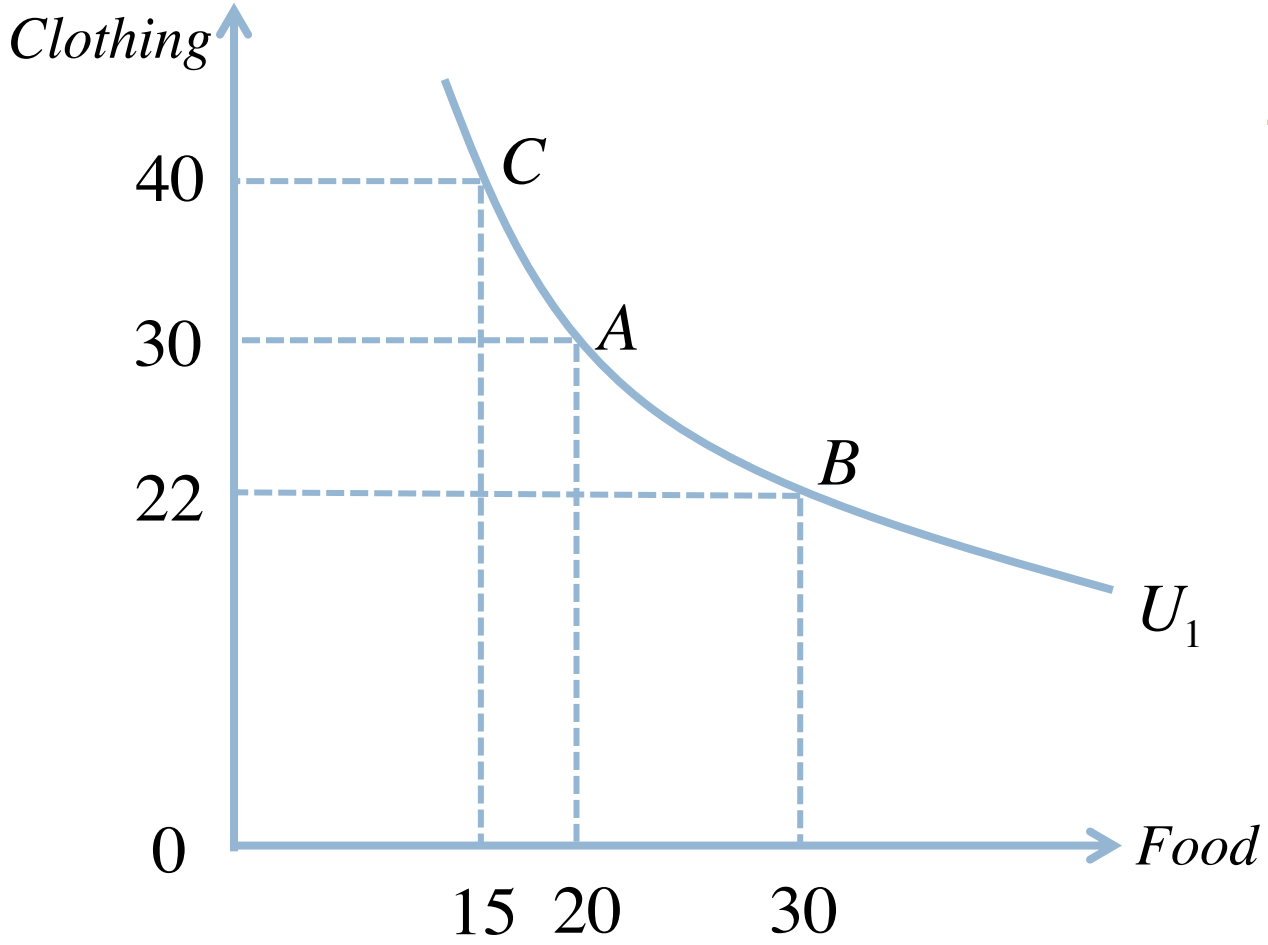
Fundamental Assumptions on Preference

- Completeness
  - For any two baskets A and B
  - Either $A \succ B$
  - Or $B \succ A$
  - Or $A \approx B$
- Transitivity
  - If $A \succ B$ and $B \succ C$, then $A \succ C$
  - Similarly, if $A \succ B$ and $B \approx C$ then $A \succ C$

How to represent preference in graph?

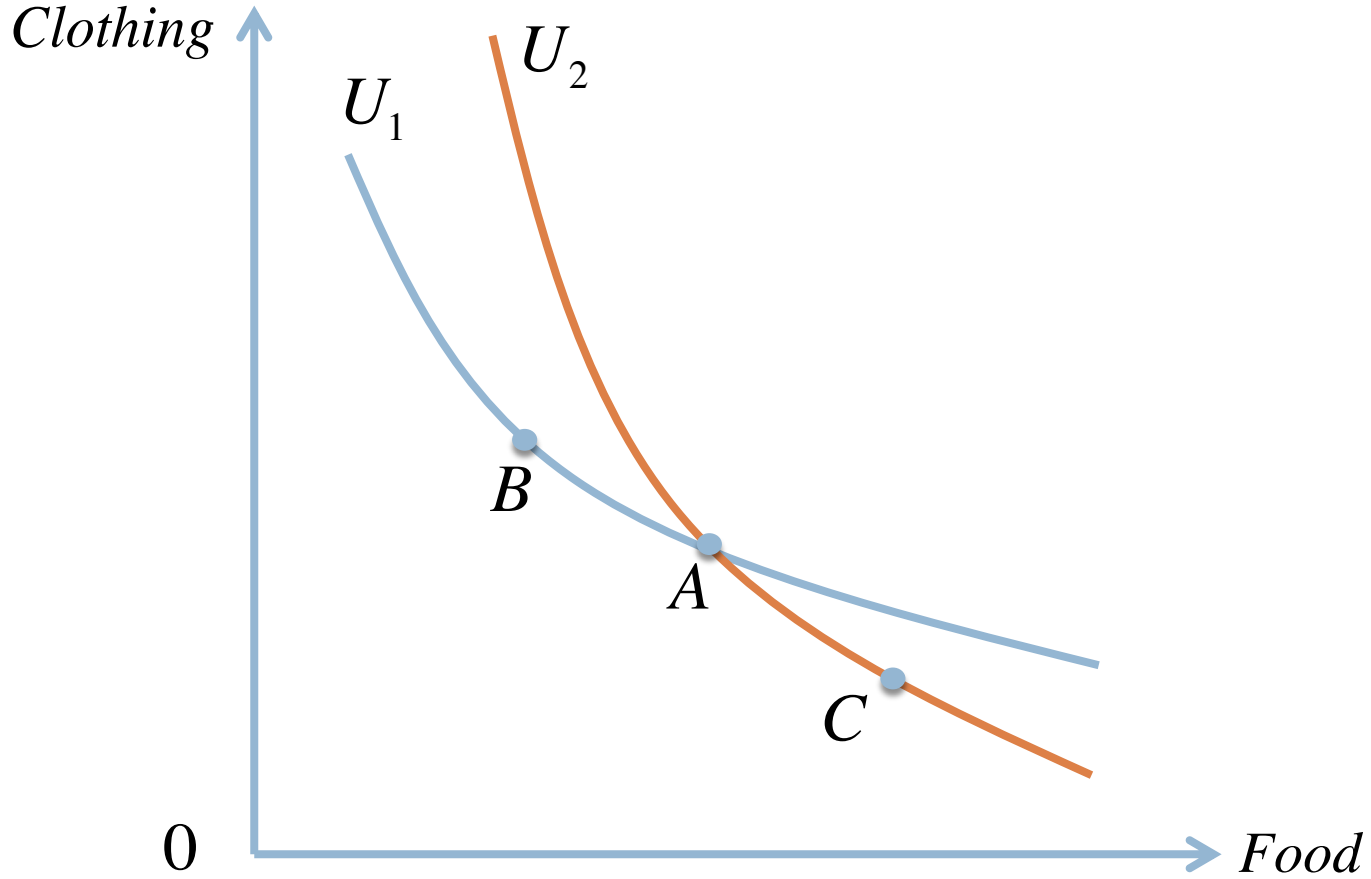
- Suppose a consumer is indifferent between
  - A: 20 units of food + 30 units of clothing
  - B: 30 units of food + 22 units of clothing
  - C: 15 units of food + 40 units of clothing

Indifference Curve



Definition 1.3 An *indifference curve* of a consumer connects all consumption baskets that give the consumer the same level of satisfaction

Indifference curves do not cross!

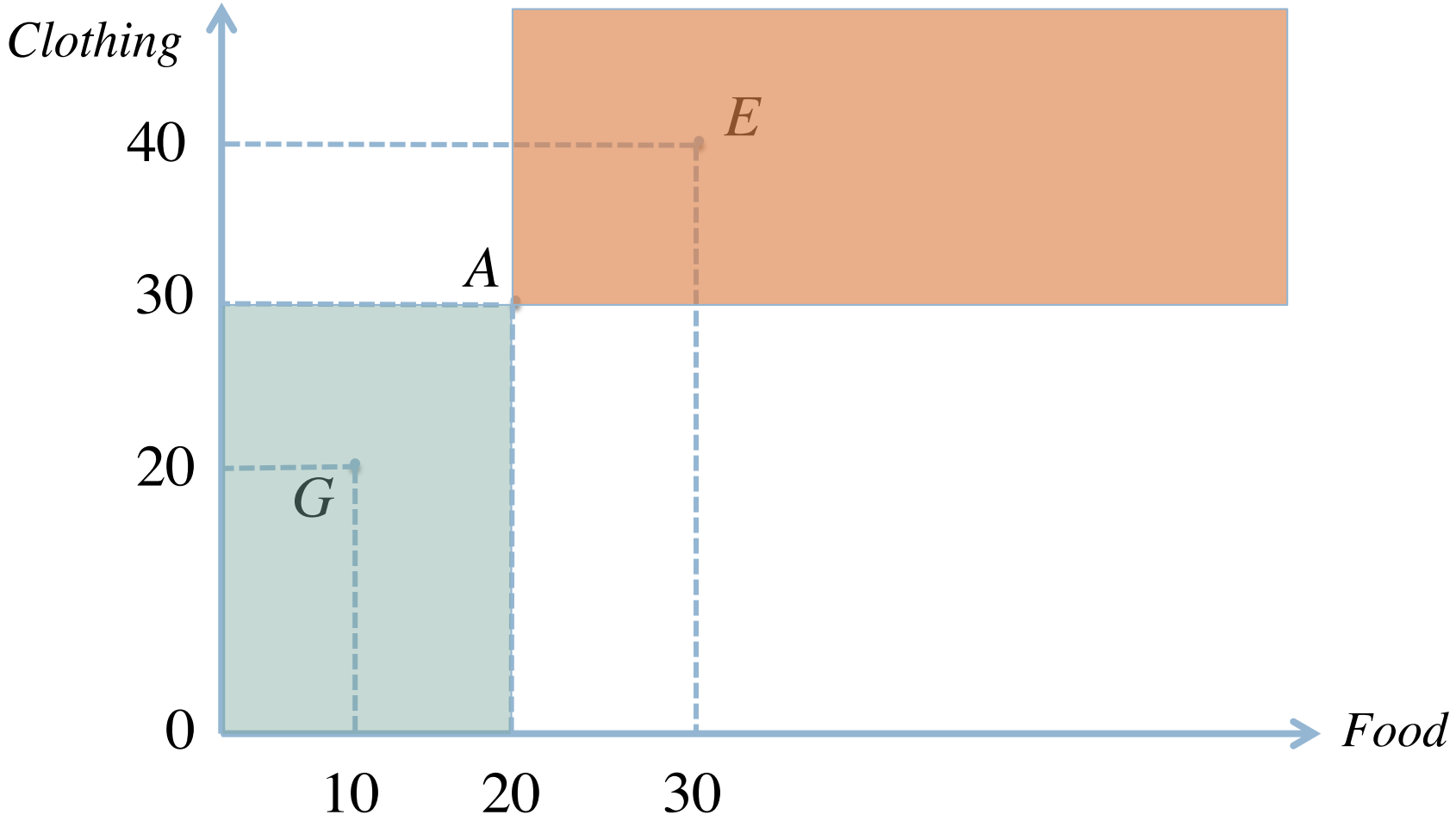


Since A=B and A=C
By transitivity, B=C

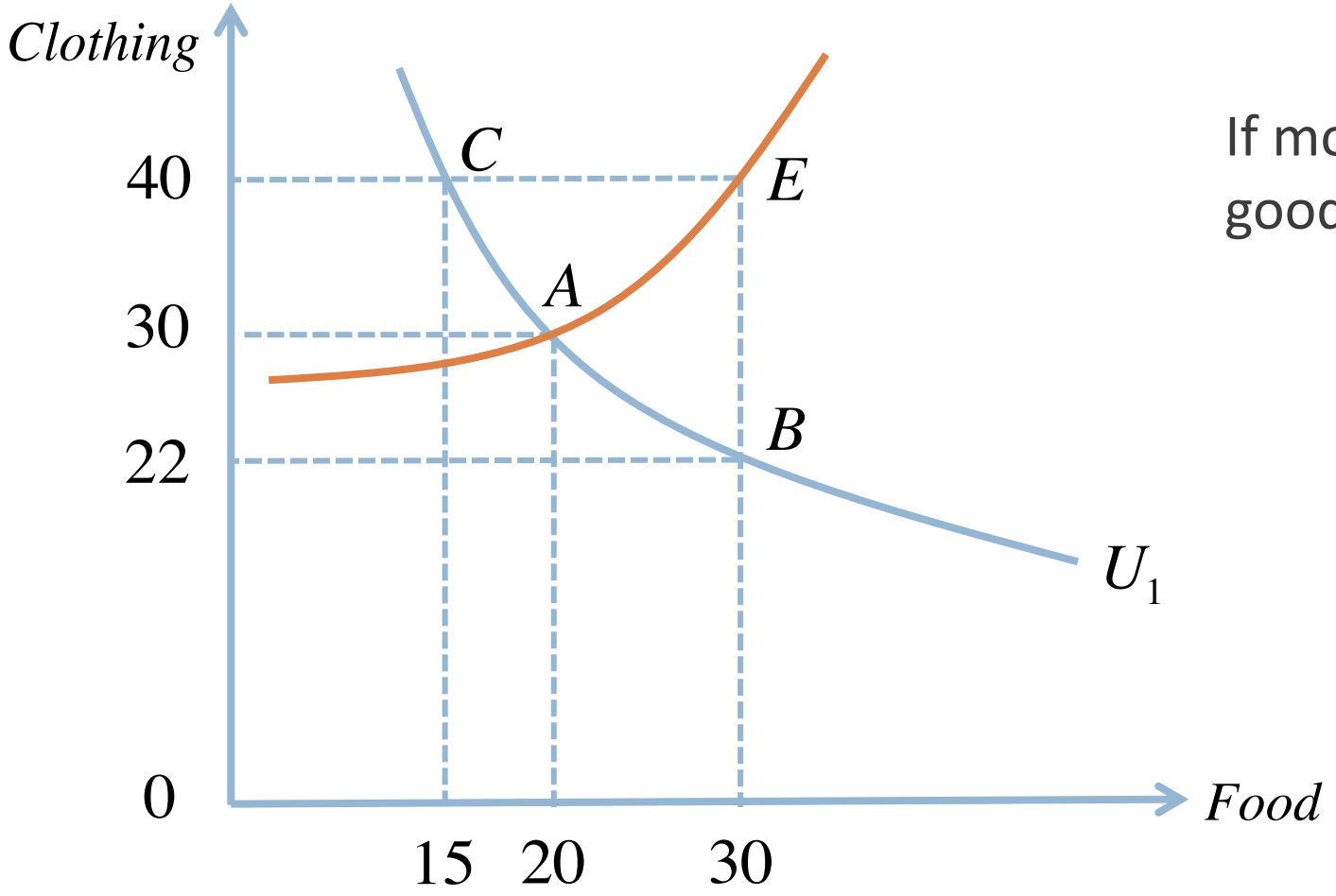
Another Common Assumption on Preference

- If “more is better” is satisfied for a good
  - Consumer likes the good
  - Consuming more increases satisfaction level
- For example, if “more is better” is satisfied for both food and clothing
  - 20 units of food + 30 units of clothing preferred to 19 units of food +30 units of clothing
  - 20 units of food + 30 units of clothing preferred to 20 units of food + 26 units of clothing
  - 20 units of food + 30 units of clothing preferred to 18 units of food + 28 units of clothing

Which baskets are preferred/less preferred to A?

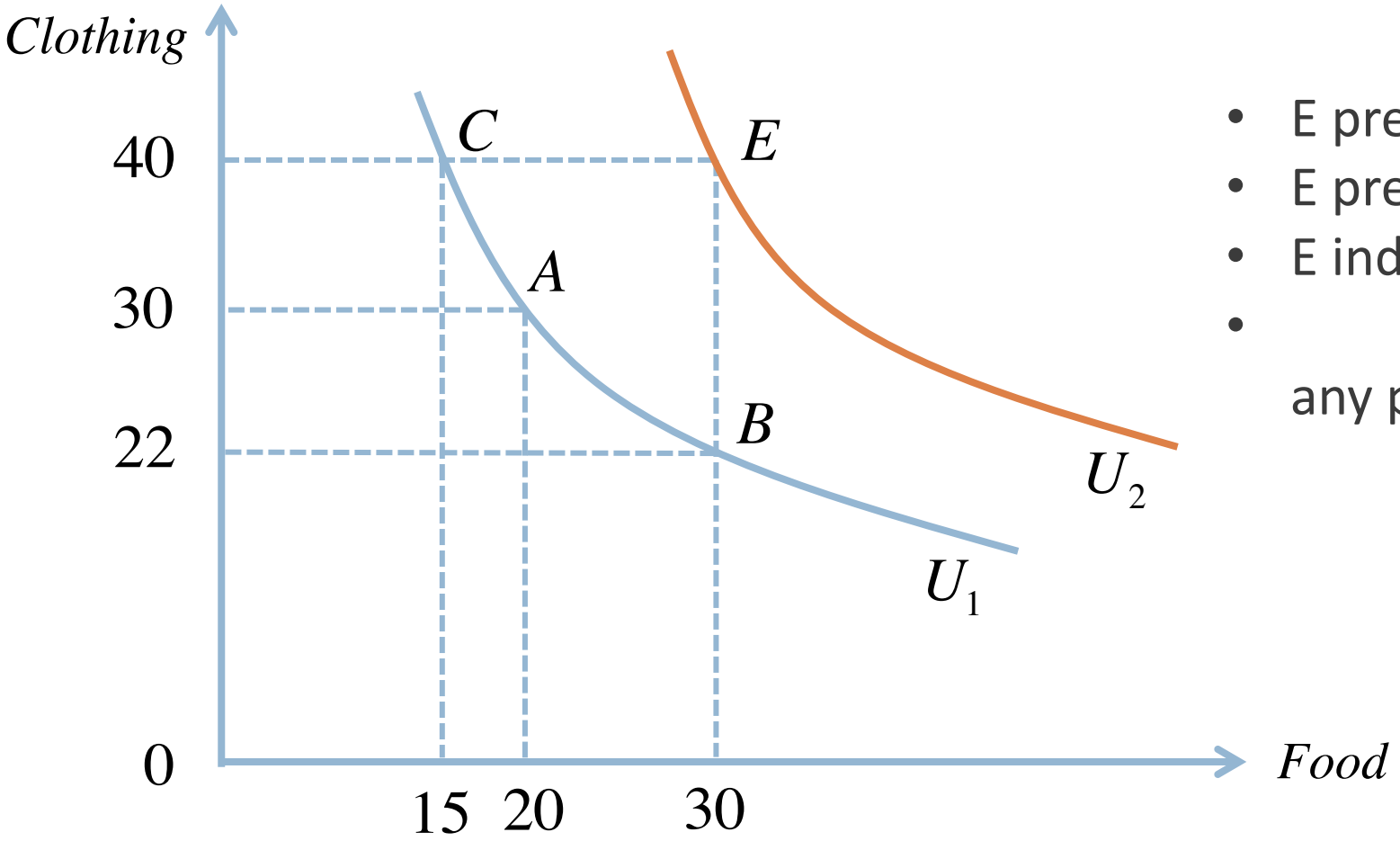


Indifference Curves are Downward Sloping when Consumer Likes Both Goods



If more is better is satisfied for both goods, E should be preferred to A

Direction of Preference when Consumer Likes Both Goods



- E preferred to A
- E preferred to
- E indifferent to any point on U_2
- preferred to any point on U_1

Summary on Three Assumptions

- We always assume
  - Completeness
  - Transitivity
- "More is better" may be violated
  - E.g., Shin-chan hates "bell pepper" but likes "hamburger"
    - "More is better" not satisfied for bell pepper
    - More bell pepper, lower satisfaction