Chapter 3

Underlying Micro Theory

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Chapter 2.9: Graphing

Before we formally define the structure of our microfoundations, let's work through a crash course on graphing

- These skills will be needed for the *entirety* of the course

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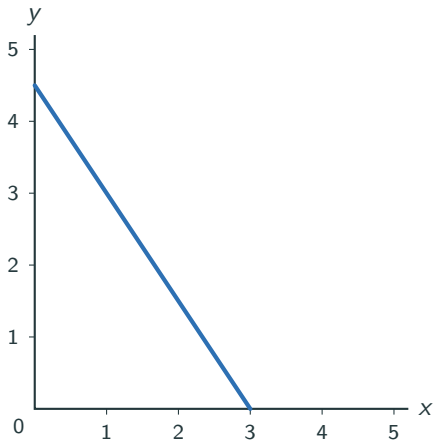
Graphing: Lines

Equation of line: $y = mx + b$

- y = vertical axis
- x = horizontal axis
- m = slope
- b = vertical intercept

$y = -1.5x + 4.5$

Slope: change in y from changing x



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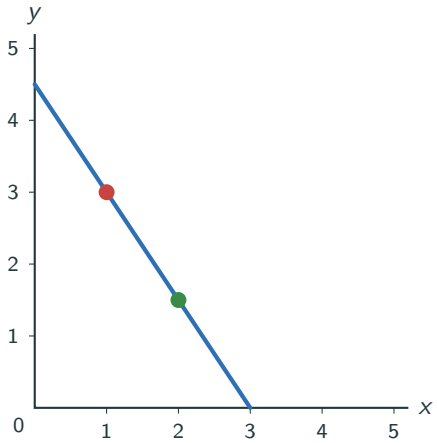
Graphing: Points

Points are listed as (x, y)

- First point: $(1, 3)$
- Second point: $(2, 1.5)$

CHANGING A POINT ON EITHER AXIS DID NOT MOVE THE LINE

- Just new (x, y) on $y = -1.5x + 4.5$



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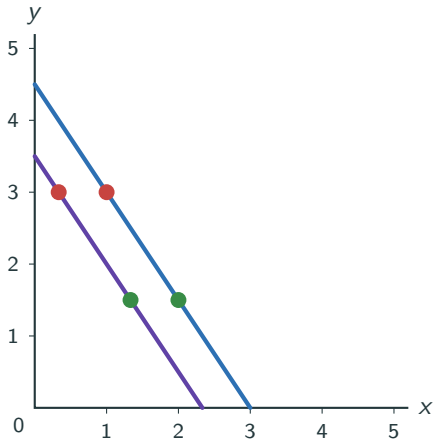
Graphing: Shifting Lines

Changing b will shift the line

- Same y, but new x

Changes in b will have an economic interpretation depending on the problem

- E.g. capital breaks down faster; for a given interest rate, people invest less



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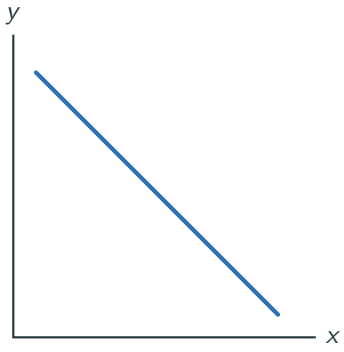
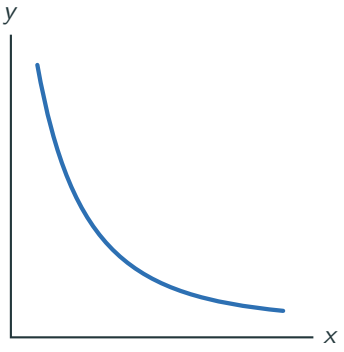
Does It Matter How I Draw the Lines?

Mostly, no. Unless we state why a curve looks a certain way, either of these is fine:





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Working Back to Micro

The previous chapter lays out the basics of macroeconomic accounting

- Aggregate variables like Y, C, π, etc.

Now we need to establish the foundations of the micro theory that will underpin the economic decisions in our model

- Do people adjust consumption or labor when interest rates change?
- How do firms respond to changes in government spending?

We'll use the strictest foundations to simplify things, but we'll still be able to build large models that qualitatively match the data

- The more theory classes you take, the more you can relax these assumptions

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3 Key Effects for This Class

1. Wealth Effect
2. Substitution Effect
3. Diminishing Marginal Benefit

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Wealth Effect

Wealth Effect: an increase in the present value of your lifetime wealth leads to more consumption of all goods

- We assume goods are **normal**; demand increases with wealth
- **Inferior** goods decrease with wealth (ex: fast food)

Includes future wealth

- If you know you'll win the lottery in a month, you'll spend some of that now
- **Consumption smoothing:** people prefer stable consumption over time, not large jumps (Friedman, 1957)

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Income Effect

Similarly, an **Income Effect** will change demand based on current real income

- If your purchasing power increases, so does demand

When studying consumption over time, changes in current real income can be understood as changes in lifetime wealth

- We will analyze this through the lens of a wealth effect
  - *My apologies to the supporters of Eugen Slutsky* (Slutsky, 1915)

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Substitution Effect

Substitution Effect: a change in the **relative price** of a good will lead consumers to substitute to the cheaper good

- Price of one good in terms of another

Example of relative price:

- Price of apples = 3
- Price of oranges = 2
- Rel. price of apples = 1.5 oranges

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Diminishing Marginal Benefit

Diminishing Marginal Benefit: each additional unit will have a smaller effect on the total

- Best explained by example. This is saved for Ch. 4
- Still important to flag now

What are the benefits?

- HH: utility from consumption and/or leisure
- Firm: value from labor and/or capital productivity

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Economic Agents

3 *general* economic agents:

1. Households (HHs)
2. Firms
   2.1 Banks mostly work in the background for now
3. Governments

Firms and HHs both have a "problem to solve"

- Governments studied for policy analysis

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Rational Choices

The HH's "problem" is to maximize utility, given constraints

- **Utility** is any benefit from a choice made
- Called "felicity" in some contexts; roughly akin to happiness
  - Fun thought: if donating to charity brings utility, does altruism exist?

Assumption of Rational Choices:

- HHs will try to maximize utility, given constraints
  - ▷ Recall: "What Do Microfoundations Tell Us?" slide from Ch. 1
- Firms will try to maximize value, given constraints

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Rational Choices and Intelligence

I make no claims about intelligence (for myself included)

- If dumpster diving for used coffee cups brings you the most utility, then that's what you'll do
- Utility/value is subjective!!!!

Gathering information can cost time and money

- May make some rational decisions appear irrational to others
- Sometimes information is wrong; sometimes the world is uncertain
- Utility is subjective, including the utility of information

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Rational Preferences

Rational preferences satisfy the first two **choice axioms**

The **choice axioms** are the foundations of HH preferences

- Based on relationships of goods (or baskets of goods)
- Focus for us is macro applications, not really strong theory
- Five in total

Notation used:

- $\succ$ means "is preferred to"
- $\succcurlyeq$ means "is at least as good as" or "weakly preferred to"
- $\sim$ symbolizes indifference between options

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Rationality of Preferences

Axioms for rationality:

1. **Complete preferences:** consumers can make comparisons
   - Ex: apple $\succcurlyeq$ orange or orange $\succcurlyeq$ apple
2. **Transitive preferences:** consumers are (basically) consistent
   - If: apple $\succ$ orange, and orange $\succ$ banana, then apple $\succ$ banana
   - No *in*transitive cycling (banana $\succ$ apple)
   - ICs cannot cross

Are you allowed to change your mind?

- Of course! Time, thought effort, brain power, etc. are all variables
- Changing a variable changes the outcome

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Indifference Curves

Indifference curves (IC) represent utility on a graph

Important properties:

1. All points on the curve have the same utility
2. The higher the IC, the more utility (ordinal)
3. Infinite number of potential ICs for any combination of goods

We'll make some assumptions to standardize ICs

- Different theory classes will look at different preferences
- Macro generally uses "well-behaved" ICs

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Continuity Axiom

3. **Continuity:** ICs don't have gaps or jumps
   - If apples $\succ$ oranges $\succ$ bananas, then for a particular $\lambda \ldots$
     - (λ) apples $+ (1 - \lambda)$ bananas $\sim$ oranges, $\quad \lambda \in (0, 1)$
   - Rules out Lexicographic preferences
   - (Probably the definition that changes the most in higher-level classes)

What does this mean for us?

- Rational preferences that are continuous can be described with a utility function

  (Debreu, 1954)

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[Non] Satiety Axiom(s) (1/2)

4a. Local Non-satiation: there is always a small change you can make that will leave you better off

- Could be increasing *or decreasing* in quantity
- Ex: having 3 cups of coffee can be preferable to having 4

4b. Weak Monotonicity: more is never worse

- Do I need another book to go unread on my shelf?
- No, but I'm not worse off if one showed up there

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[Non] Satiety Axiom(s) (2/2)

4c. Strict Monotonicity: more is always better

- Rules out perfect complements (Leontief preferences)
- Implies both 4a and 4b; neither 4a nor 4b implies the other

What does this mean for us?

- We essentially have 3 goods:
  1. Consumption today
  2. Consumption in the future
  3. Leisure (may occasionally touch on leisure in the future)
- All else equal, the HH prefers more of all of these

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Convexity Axiom(s) (1/2)

5a. Weak Convexity: a combination of 2 goods is at least as appealing as the less-preferred good

- If apples $\succcurlyeq$ oranges, then...
  - (λ) apples $+ (1-\lambda)$ oranges $\succcurlyeq$ oranges, $\quad \forall \lambda \in [0,1]$

5b. Strict Convexity: same thing, but the combination will always be preferred to the less-preferred good

- (λ) apples $+ (1-\lambda)$ oranges $\succ$ oranges, $\quad \forall \lambda \in (0,1)$
- Rules out perfect substitutes

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Convexity Axiom(s) (2/2)

What does this mean for us?

- Helps us explain the marginal rate of substitution later
- Final piece that gives ICs their curved appearance
- *Since we're working with normal goods, an increase in income means the HH will save some so they can have more consumption today and tomorrow*

HHs don't only prefer 1 thing

- Better to have multiple goods, experiences, sources of happiness than only one
- "*Variety's the very spice of life*" (Cowper, 1785)

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The Macro-252 Cheat Sheet of Preferences

A. Completeness + Transitivity = rational preferences

B. Completeness + Transitivity + Continuity $\Rightarrow$ utility function
   - A and B mostly work in the background for us

C. Strict Monotonicity = HH likes more stuff
   - Solidifies our Wealth Effects

D. Strict Convexity = Combos preferred to single extremes
   - We'll use this as a "calculus workaround"
   - Solidifies consumption smoothing with normal goods

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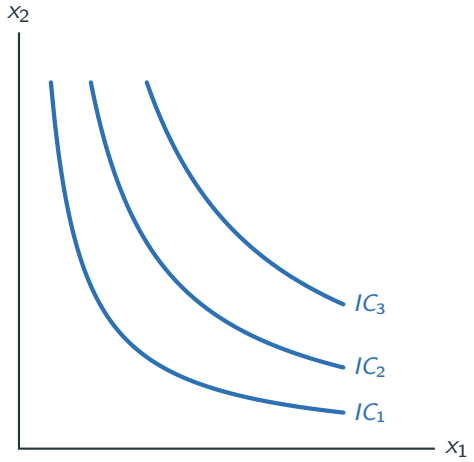
Our "Well-behaved" Indifference Curves



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Satisfying Conditions

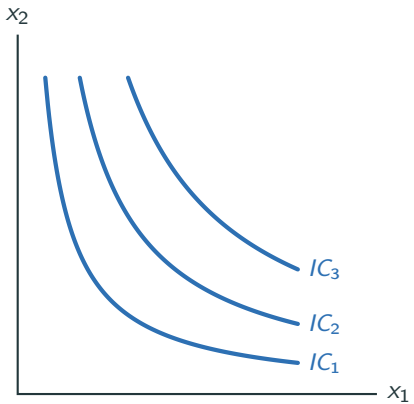
Complete:

Transitive:

Continuous:

Strictly monotonic:

Strictly convex:



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