Microeconomic Analysis

Consumer Choice

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Reading: Perloff, Chapter 4

Outline

- Preferences
- Utility
- Budget Constraint
- Constrained Consumer Choice

Preferences

- Individual **preferences** determine the amount of pleasure people derive from the goods and services they consume.
- Consumers face **constraints** or limits on their choices.
- Consumers **maximize** their well-being or pleasure from consumption, subject to the constraints they face.

Properties of Consumer Preferences

- **Completeness** - when facing a choice between any two bundles of goods, a consumer can rank them so that one and only one of the following relationships is true:

1. The consumer prefers the first bundle to the second
2. The consumer prefers the second to the first
3. The consumer is indifferent between them

Properties of Consumer Preferences

- **Transitivity -** a consumer's preferences over bundles is consistent in the sense that, if the consumer *weakly prefers* Bundle *z* to Bundle *y* (likes *z* at least as much as *y*) and weakly prefers Bundle *y* to Bundle *x*, the consumer also weakly prefers Bundle *z* to Bundle *x*.

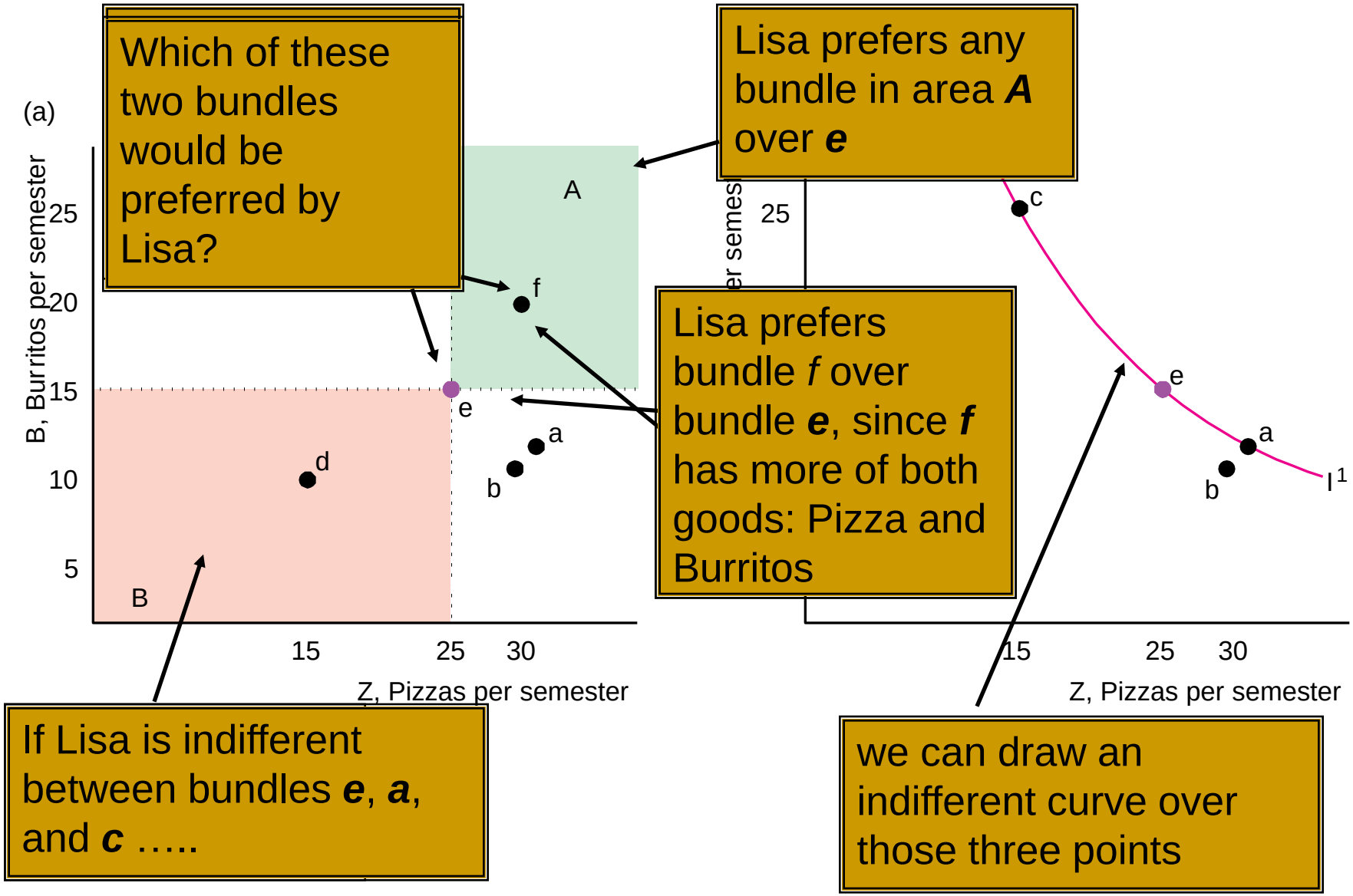
Properties of Consumer Preferences

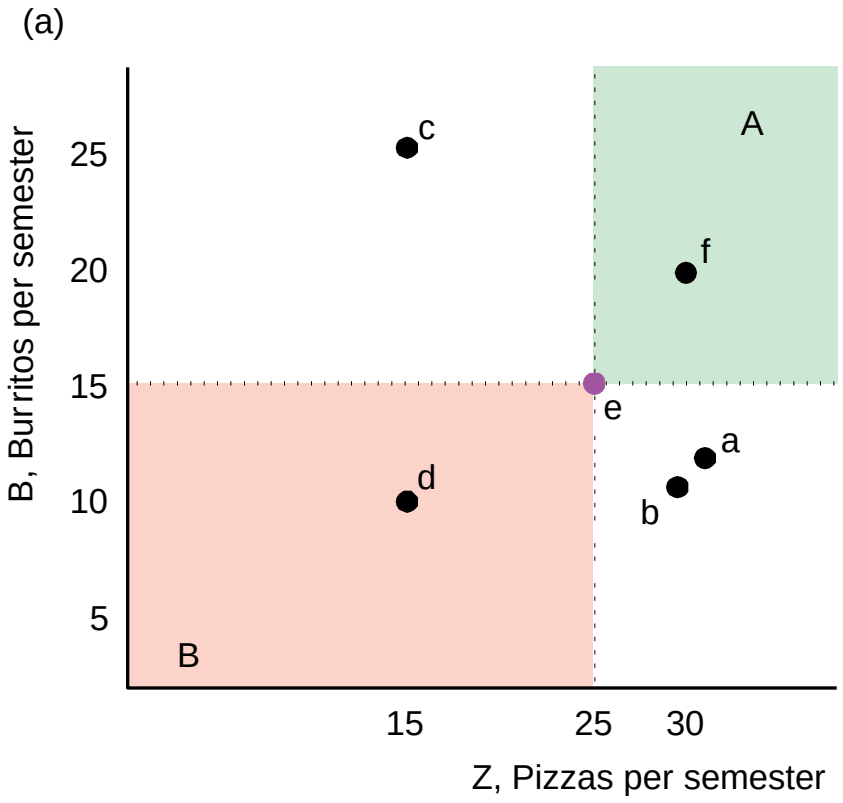
- **Nonsatiation -** all else being the same, more of a commodity is better than less of it
  - **Good -** a commodity for which more is preferred to less, at least at some levels of consumption
  - **Bad -** something for which less is preferred to more, such as pollution

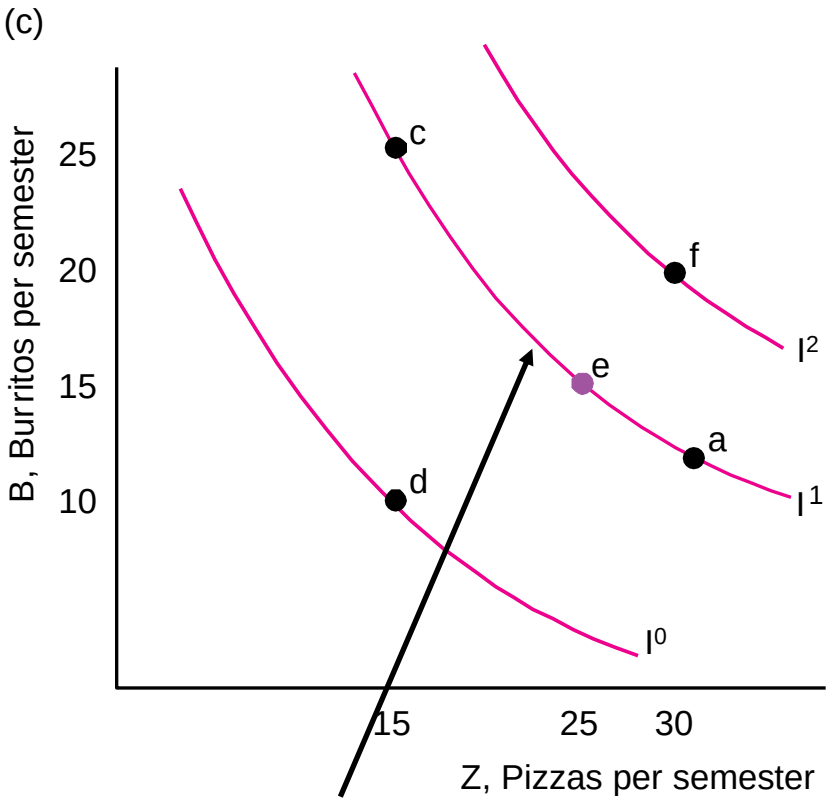
Indifference Curves

- **Indifference curve -** the set of all bundles of goods that a consumer views as being equally desirable.

  - **Indifference map -** a complete set of indifference curves that summarize a consumer's tastes or preferences

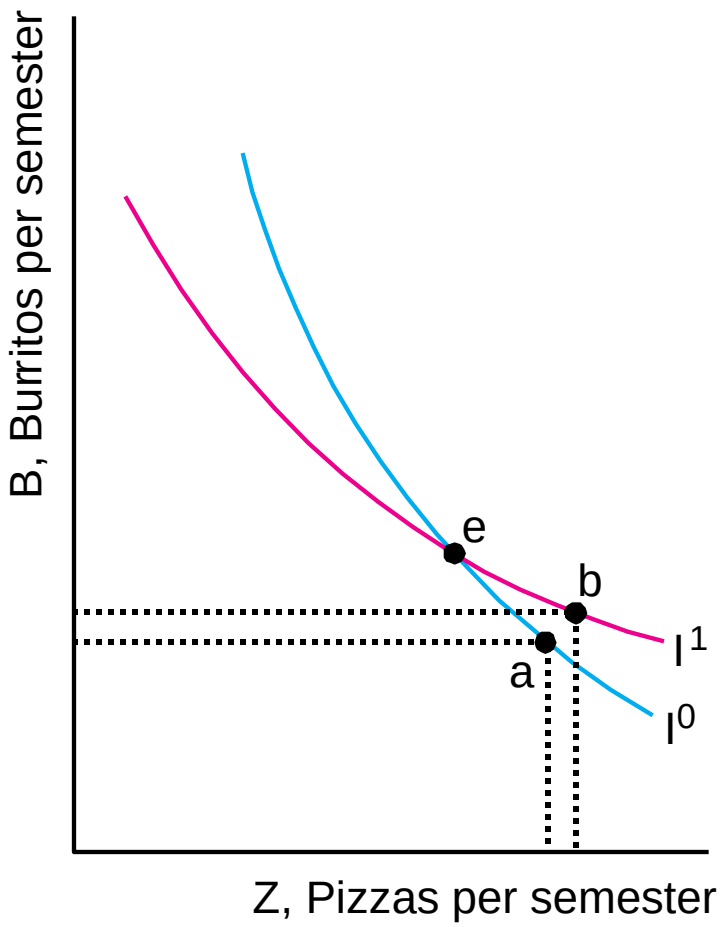

Which of these two bundles would be preferred by Lisa?
Lisa prefers any bundle in area A over e
Lisa prefers bundle f over bundle e, since f has more of both goods: Pizza and Burritos
If Lisa is indifferent between bundles e, a, and c …..
we can draw an indifferent curve over those three points
(a)
B, Burritos per semester
25
20
15
10
5
A
B
f
e
a
b
d
15
25
30
Z, Pizzas per semester
c
e
a
b
I 1





we can draw an indifferent curve over those three points

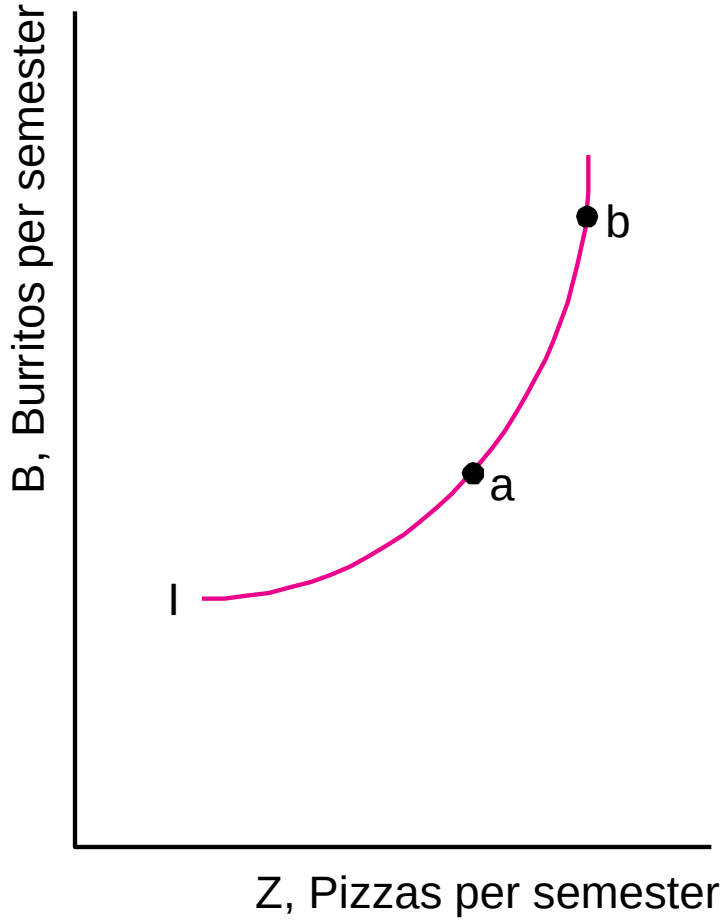
Impossible Indifference Curves



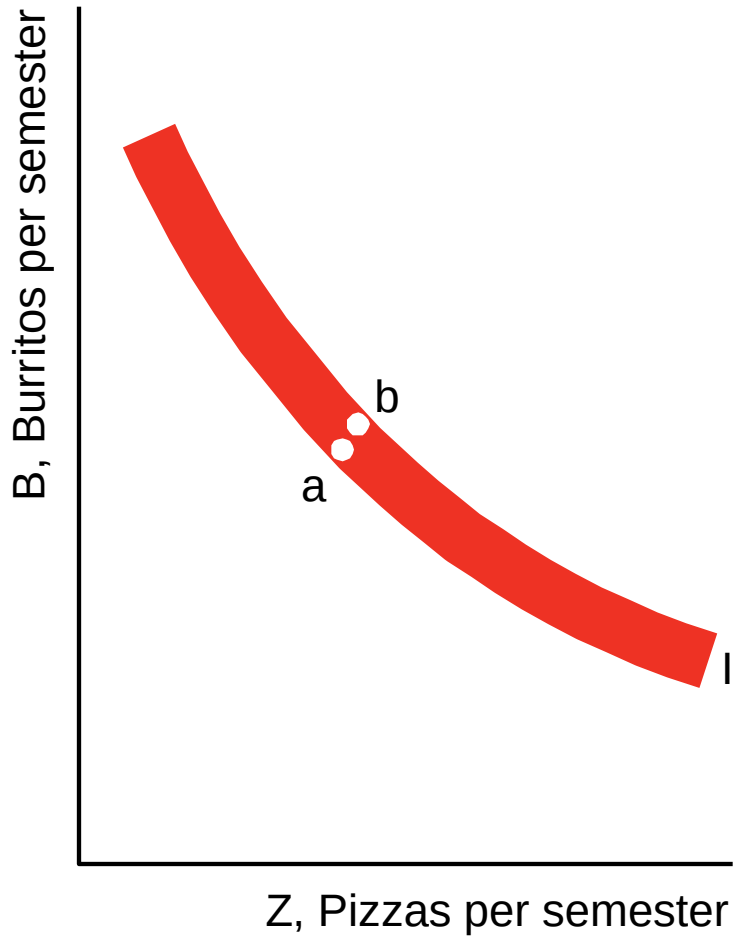
- Lisa is indifferent between ***e*** and ***a,*** and also between ***e*** and ***b***…
  - so by transitivity she should also be indifferent between ***a*** and ***b***…
  - but this is impossible, since ***b*** must be preferred to ***a*** given it has more of both goods.

Impossible Indifference Curves

- Lisa is indifferent between ***b*** and ***a*** since both points are in the same indifference curve…
  - But this contradicts the "more is better" assumption. **Can you tell why?**
  - Yes, ***b*** has more of both and hence it should be preferred over ***a***.



Impossible Indifference Curves



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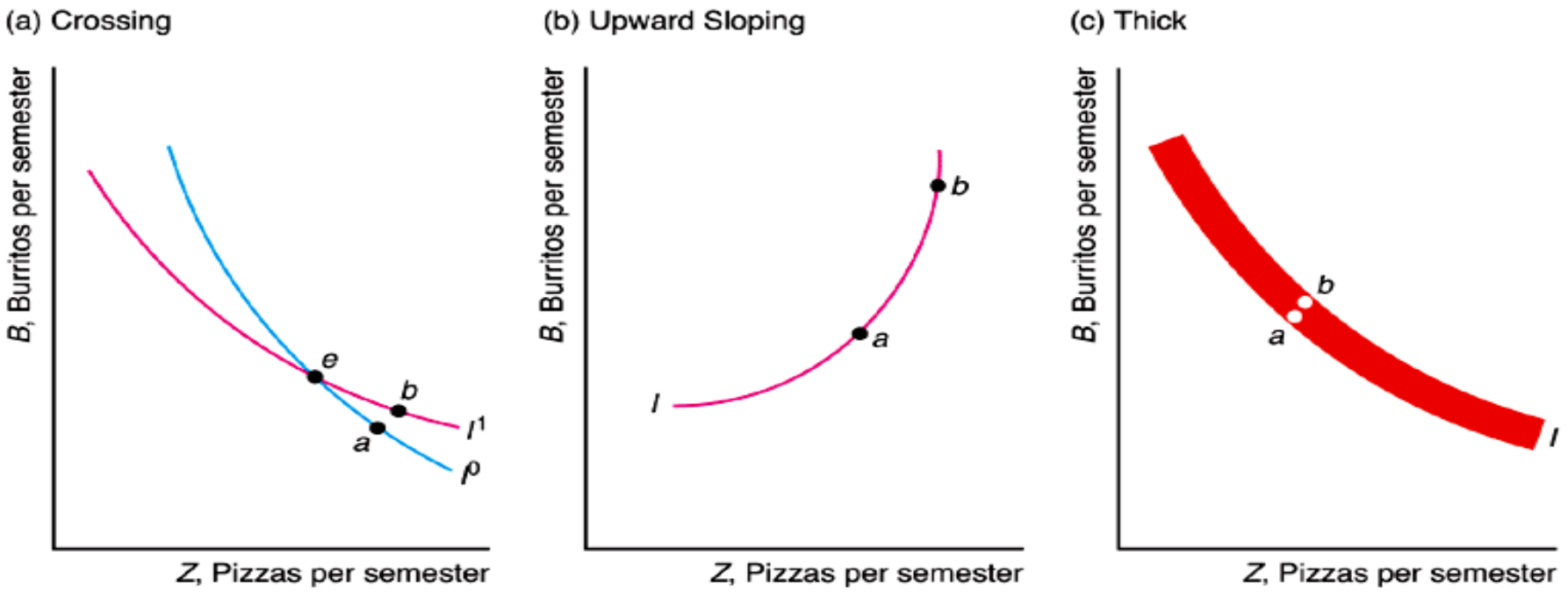
  - But this contradicts the "more is better" assumption since ***b*** has more of both and hence it should be preferred over ***a***.

Impossible Indifference Curves



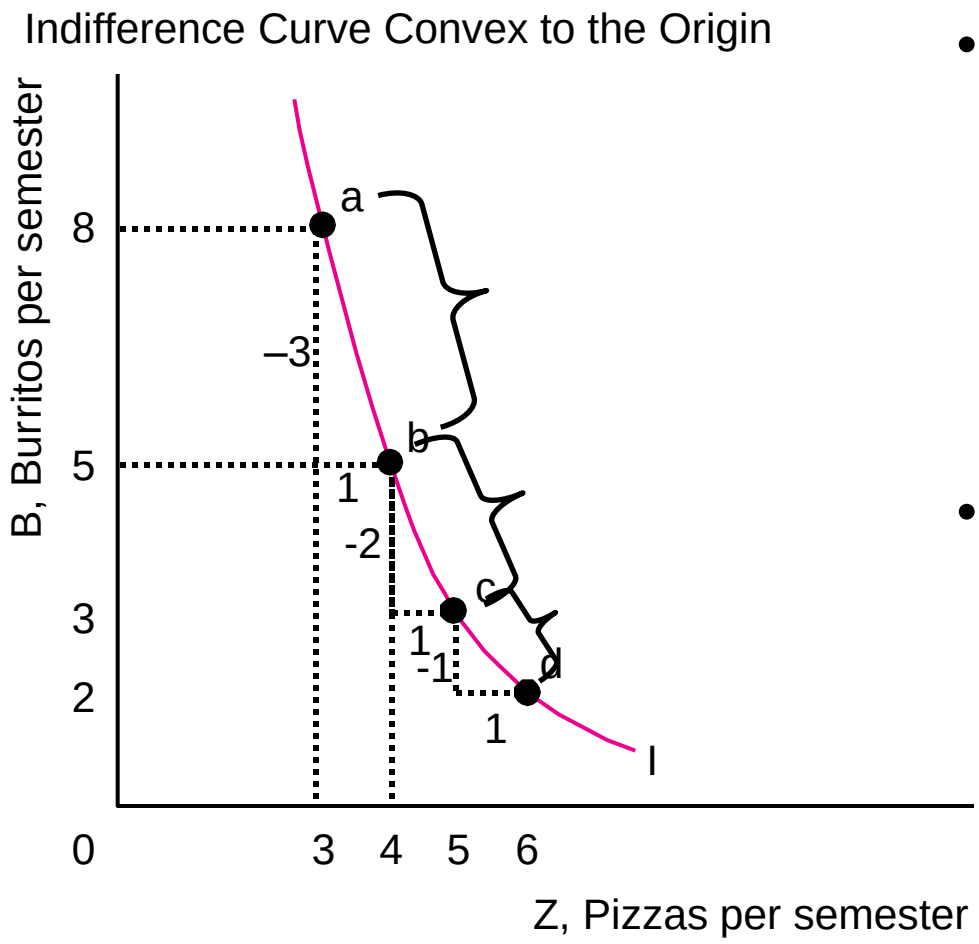
Marginal Rate of Substitution

- **marginal rate of substitution (*MRS*) -** the maximum amount of one good a consumer will sacrifice to obtain one more unit of another good.

$$MRS = \frac{\Delta B}{\Delta Z}$$

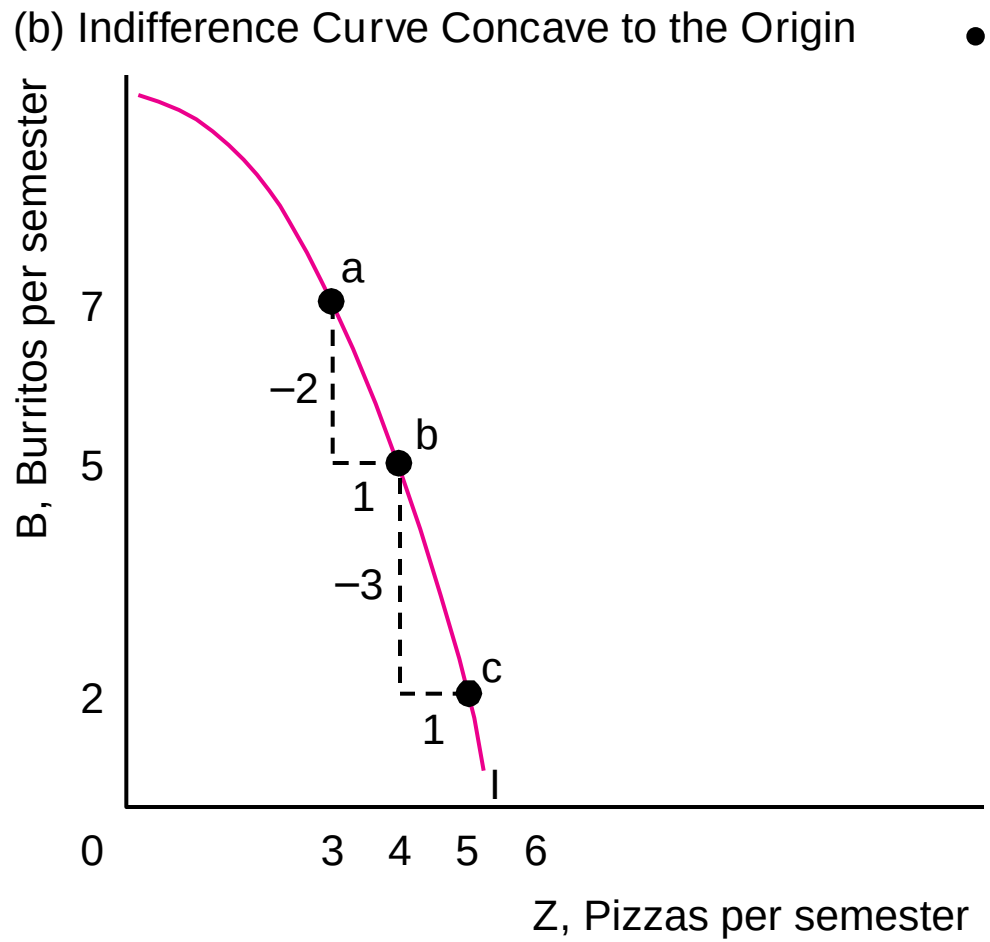
  - The slope of the indifference curve!

MRS along an Indifference curve



- The MRS from bundle ***a*** to bundle ***b*** is -3.
  - This is the same as the slope of the indifference curve between those two points.
- From ***b*** to ***c***,
  - MRS = -2.
  - This is the same as the slope of the indifference curve between those two points.

Marginal Rate of Substitution



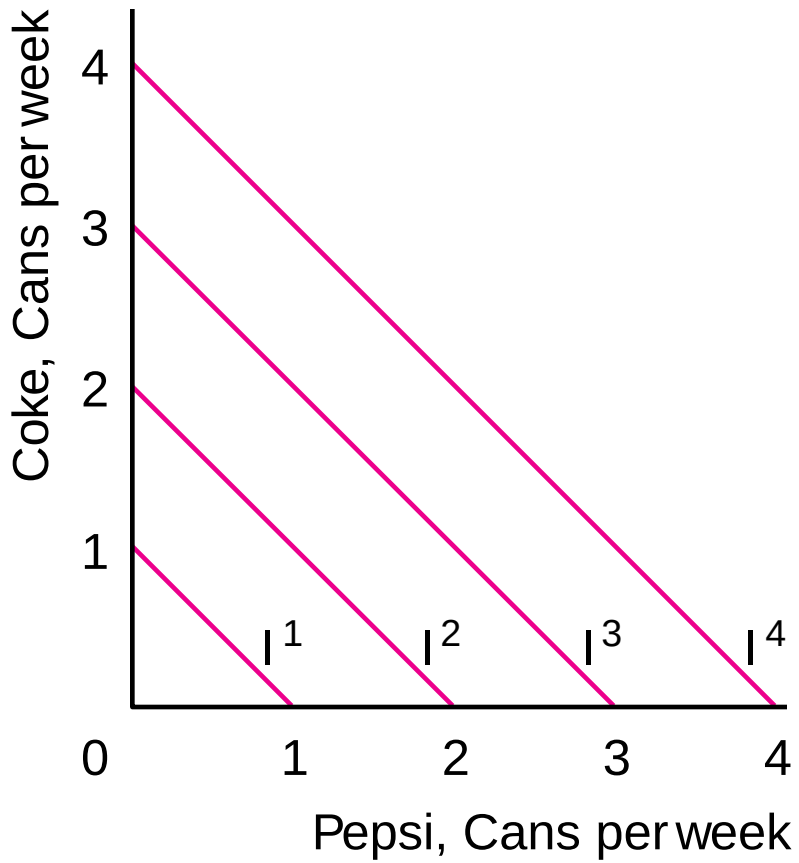
- From bundle ***a*** to bundle ***b***, Lisa is willing to give up 2 Pizzas for 1 Burrito.
  - Nevertheless, from ***b*** to ***c*** she is willing to give up 3 Pizzas for 1 burrito.
  - This is very unlikely
    - Could you think why?

Curvature of Indifference Curves

- Casual observation suggests that most people's indifference curves are **convex.**

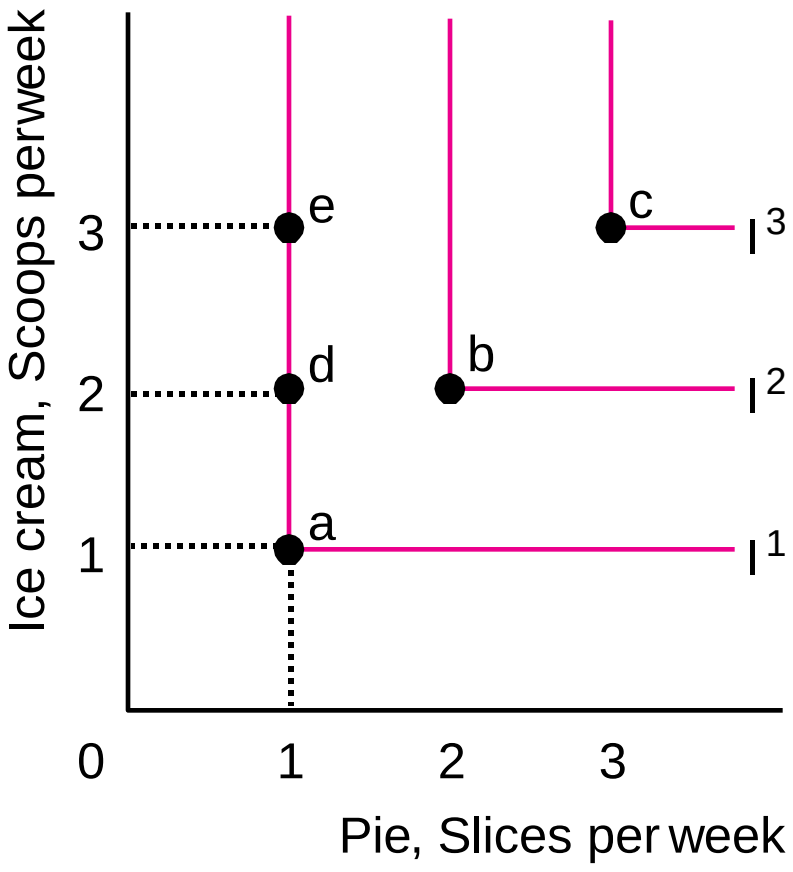
- **Exceptions:**
  - **Perfect substitutes -** goods that a consumer is completely indifferent as to which to consume.
  - **Perfect complements -** goods that a consumer is interested in consuming only in fixed proportions

Perfect Substitutes



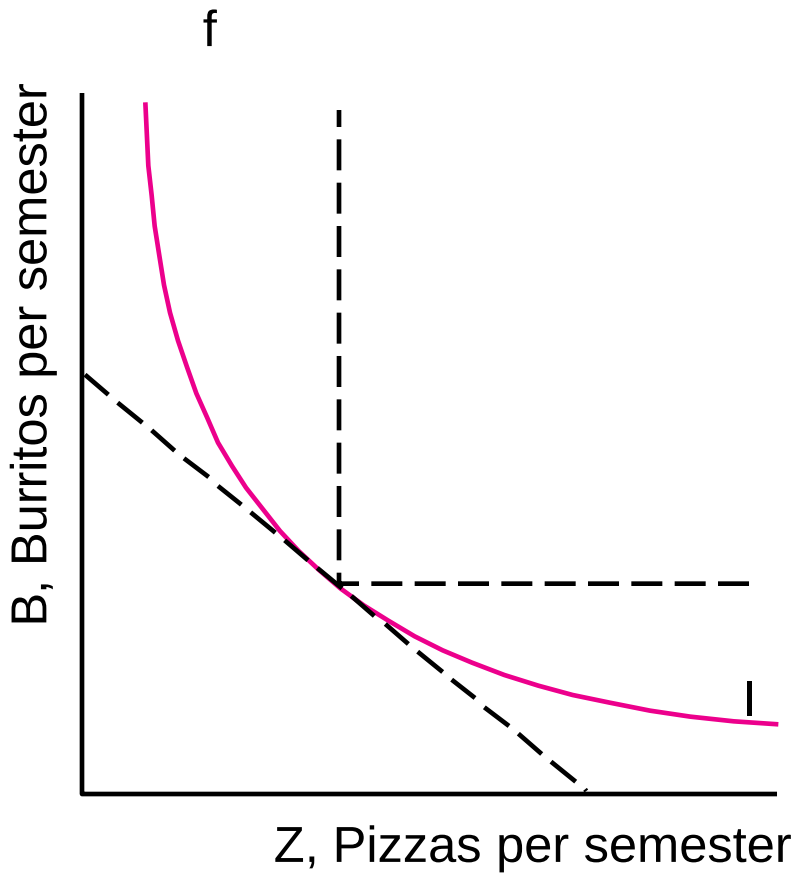
- Bill views Coke and Pepsi as perfect substitutes: **can you tell how his indifference curves would look like?**
  - Straight, parallel lines with an MRS (slope) of −1.
  - Bill is willing to exchange one can of Coke for one can of Pepsi.

Perfect Complements



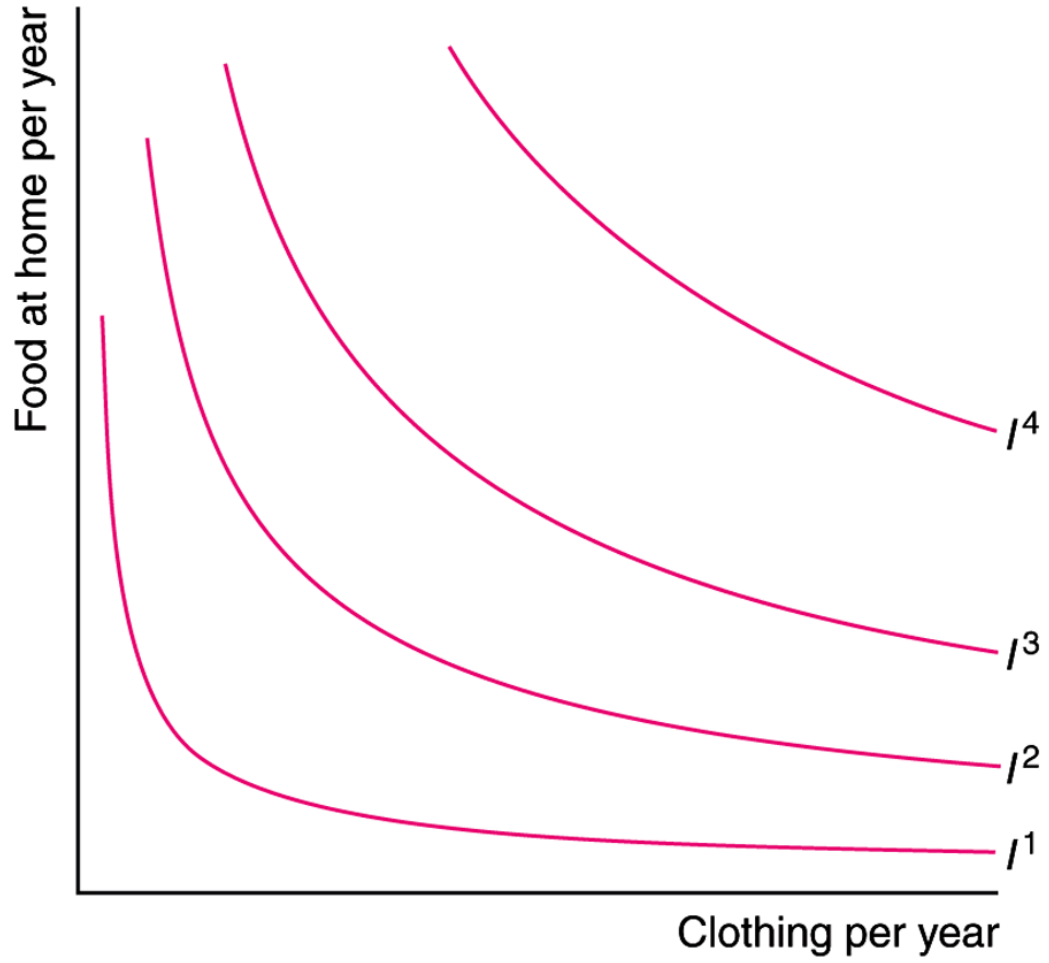
- If she has only one piece of pie, she gets as much pleasure from it and one scoop of ice cream, ***a***,
  - as from it and two scoops, ***d***,
  - or as from it and three scoops, ***e***.

Imperfect Substitutes



- The standard-shaped, convex indifference curve in panel lies between these two extreme examples.
  - Convex indifference curves show that a consumer views two goods as imperfect substitutes.

Indifference Curves Between Food and Clothing



Utility

- **Utility -** assigns numerical value to allow ranking of bundles
- **utility function -** relationship between utility values and every possible bundle of goods

$$U(B, Z)$$

- Ordinal utility refers to the relative ranking of two bundles
- Cardinal utility refers to the exact numerical values

Marginal utility

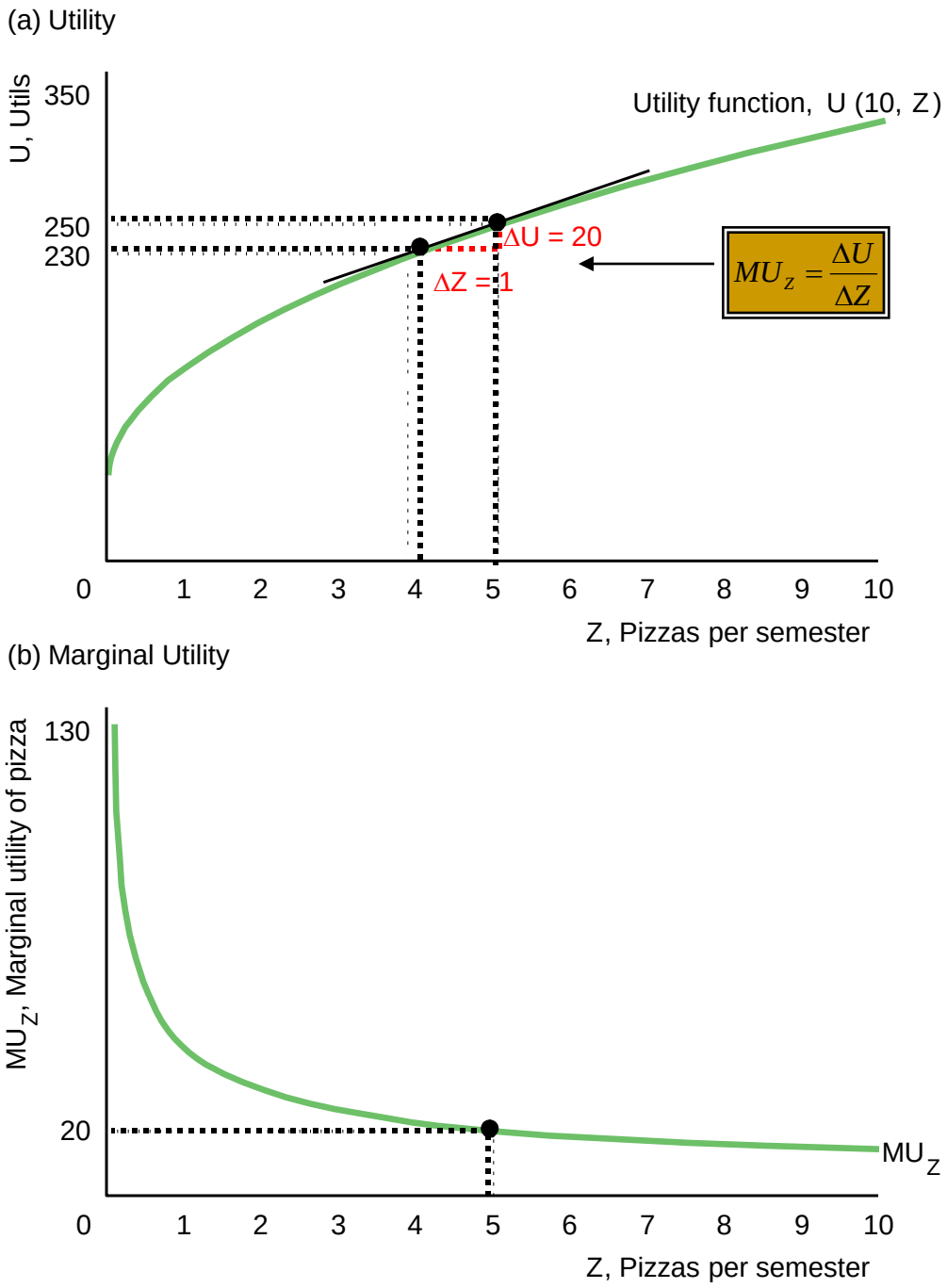
- **marginal utility -** the extra utility that a consumer gets from consuming the last unit of a good.
  - the slope of the utility function as we hold the quantity of the other good constant.

- Marginal Utility of good Z is:

$$MU_Z = \frac{\Delta U}{\Delta Z}$$

Utility and Marginal Utility

- As Lisa consumes more pizza, holding her consumption of burritos constant at 10, her total utility, *U*, increases…
  - and her marginal utility of pizza, MU_Z, decreases (though it remains positive).
- Marginal utility is the slope of the utility function as we hold the quantity of the other good constant.



Utility and Marginal Rates of Substitution

- The *MRS* is the negative of the ratio of the marginal utility of another pizza to the marginal utility of another burrito.
- Formally,

$$MRS = \frac{\Delta B}{\Delta Z} = -\frac{MU_Z}{MU_B}$$

Marginal Rate of Substitution

$$\bar{U} = U(x, y)$$

$$\Rightarrow d\bar{U} = \frac{\partial U}{\partial x} dx + \frac{\partial U}{\partial y} dy$$

$$\Rightarrow 0 = \frac{\partial U}{\partial x} dx + \frac{\partial U}{\partial y} dy$$

$$\Rightarrow \frac{\partial U}{\partial y} dy = -\frac{\partial U}{\partial x} dx$$

$$\Rightarrow \frac{dy}{dx} = -\frac{\partial U / \partial x}{\partial U / \partial y}$$

$$\Rightarrow MRS = -\frac{MU_x}{MU_y}$$

Budget Constraint

- **budget line** (or *budget constraint*) - the bundles of goods that can be bought if the entire budget is spent on those goods at given prices.

- **opportunity set -** all the bundles a consumer can buy, including all the bundles inside the budget constraint and on the budget constraint

Effect of Budget Constraint

- Budget constraint limits choice due to income restrictions
  - Mathematically: $p_x x + p_y y = m$
  - Can determine the amount of good *x* consumed:

$$p_x x = m - p_y y$$

$$\Rightarrow x = \frac{m - p_y y}{p_x}$$

  - Effect on consumption due to increase in income $\frac{\partial x}{\partial m} = \frac{1}{p_x} > 0$
  - Effect on consumption due to increase in *y* $\frac{\partial x}{\partial y} = -\frac{p_y}{p_x} < 0$
  - Effect on consumption due to increase in price of *x*

$$\frac{\partial x}{\partial p_x} = -\frac{m}{p_x^2} + \frac{p_y y}{p_x^2} = -\frac{x}{p_x} < 0$$

Budget Constraint

- If Lisa spends all her budget, *Y*, on pizza and burritos, then

$$p_B B + p_Z Z = Y$$

  - This equation is her budget constraint.
    - It shows that her expenditures on burritos and pizza use up her entire budget.

Budget Constraint (cont).

- How many burritos can Lisa buy?
  - To answer solve budget constraint for B (quantity of burritos):

$$P_B B + P_Z Z = Y$$

$$P_B B = Y - P_Z Z$$

$$B = \frac{Y - P_Z Z}{P_B}$$

Budget Constraint (cont).

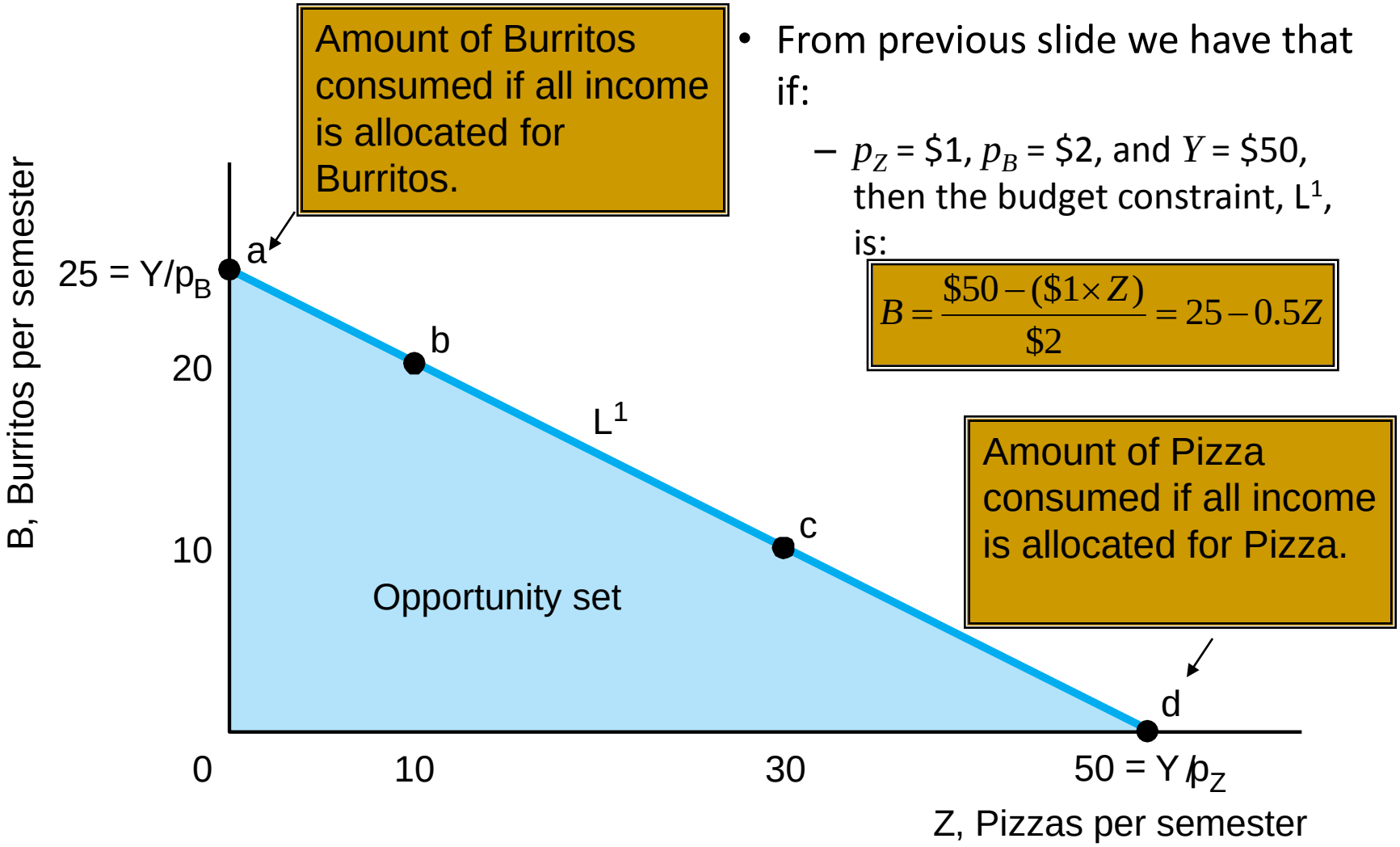
- From previous slide we have:

$$B = \frac{Y - P_Z Z}{P_B}$$

  - If p_Z = \$1, p_B = \$2, and Y = \$50, then:

$$B = \frac{\$50 - (\$1 \times Z)}{\$2} = 25 - 0.5Z$$

Budget Constraint



- From previous slide we have that if:
  - p_Z = \$1, p_B = \$2, and Y = \$50, then the budget constraint, L^1, is:

$$B = \frac{\$50 - (\$1 \times Z)}{\$2} = 25 - 0.5Z$$

The Slope of the Budget Constraint

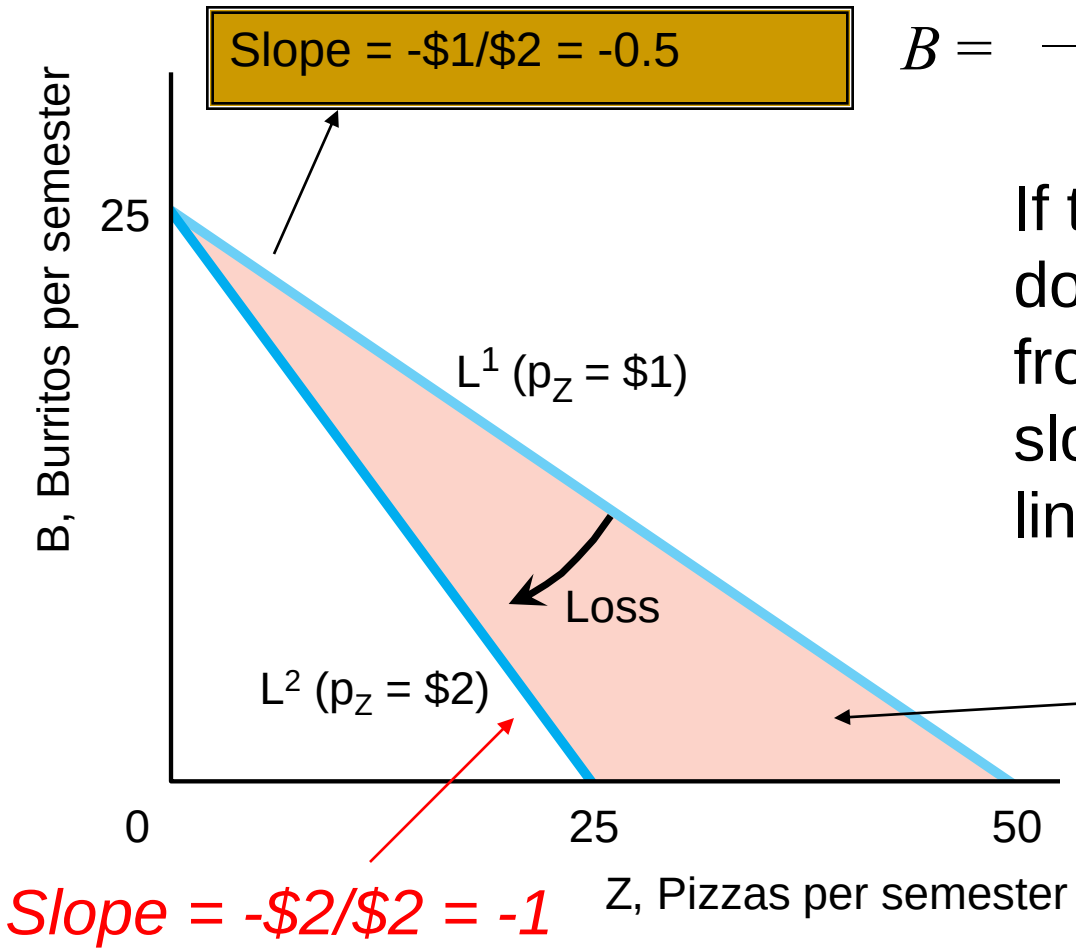
- We have seen that the budget constraint for Lisa is given by the following equation:

$$B = \frac{Y}{P_B} - \frac{P_Z}{P_B} Z$$

Slope = $\Delta B / \Delta Z$ = MRT

  - The slope of the budget line is also called the **marginal rate of transformation (*MRT*)**
    - rate at which Lisa can trade burritos for pizza in the marketplace

Changes in the Budget Constraint: An increase in the Price of Pizzas.



$$B = \frac{Y}{P_B} - \frac{P_Z = \$2}{P_B} Z$$

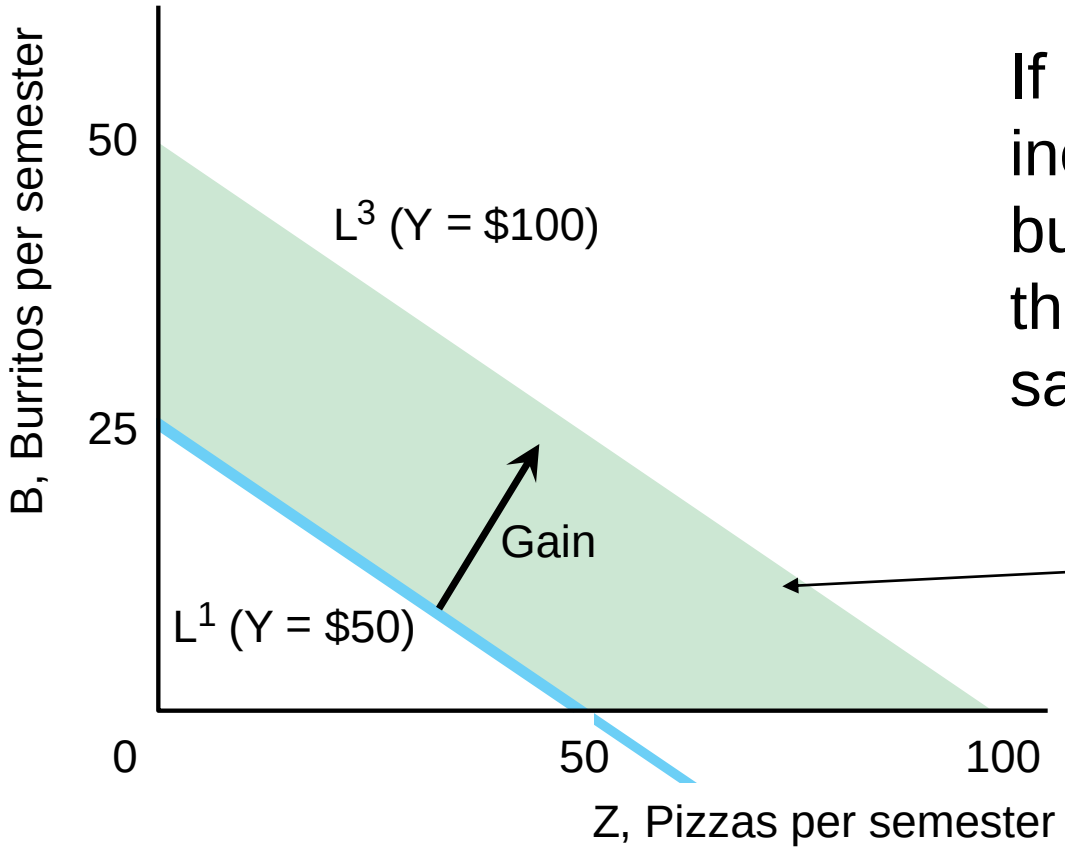
If the price of Pizza doubles, (increases from $1 to $2) the slope of the budget line increases

This area represents the bundles she can no longer afford!!!

Changes in the Budget Constraint: Increase in Income (Y)

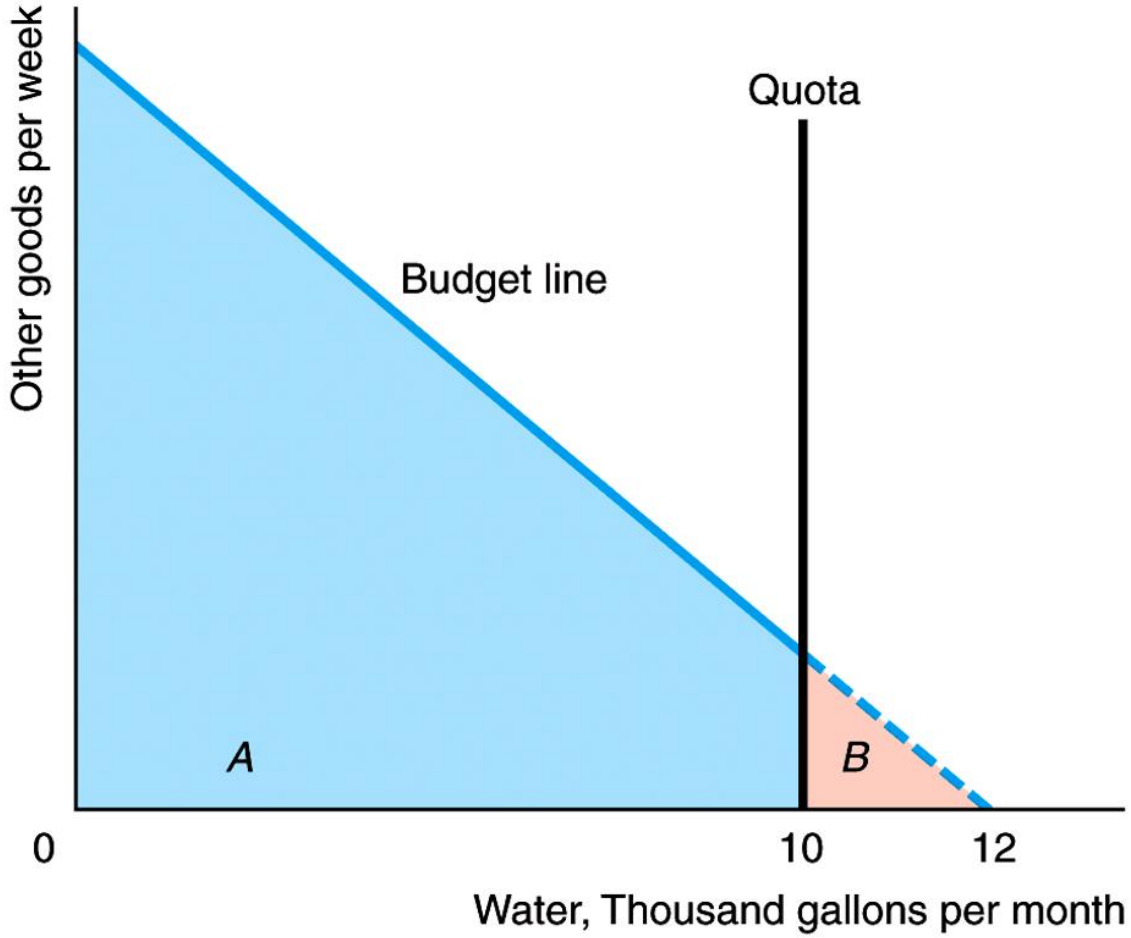
$$B = \frac{\$100}{P_B} - \frac{P_Z}{P_B} Z$$

If Lisa's income increases by $50 the budget line shifts to the right (with the same slope!)

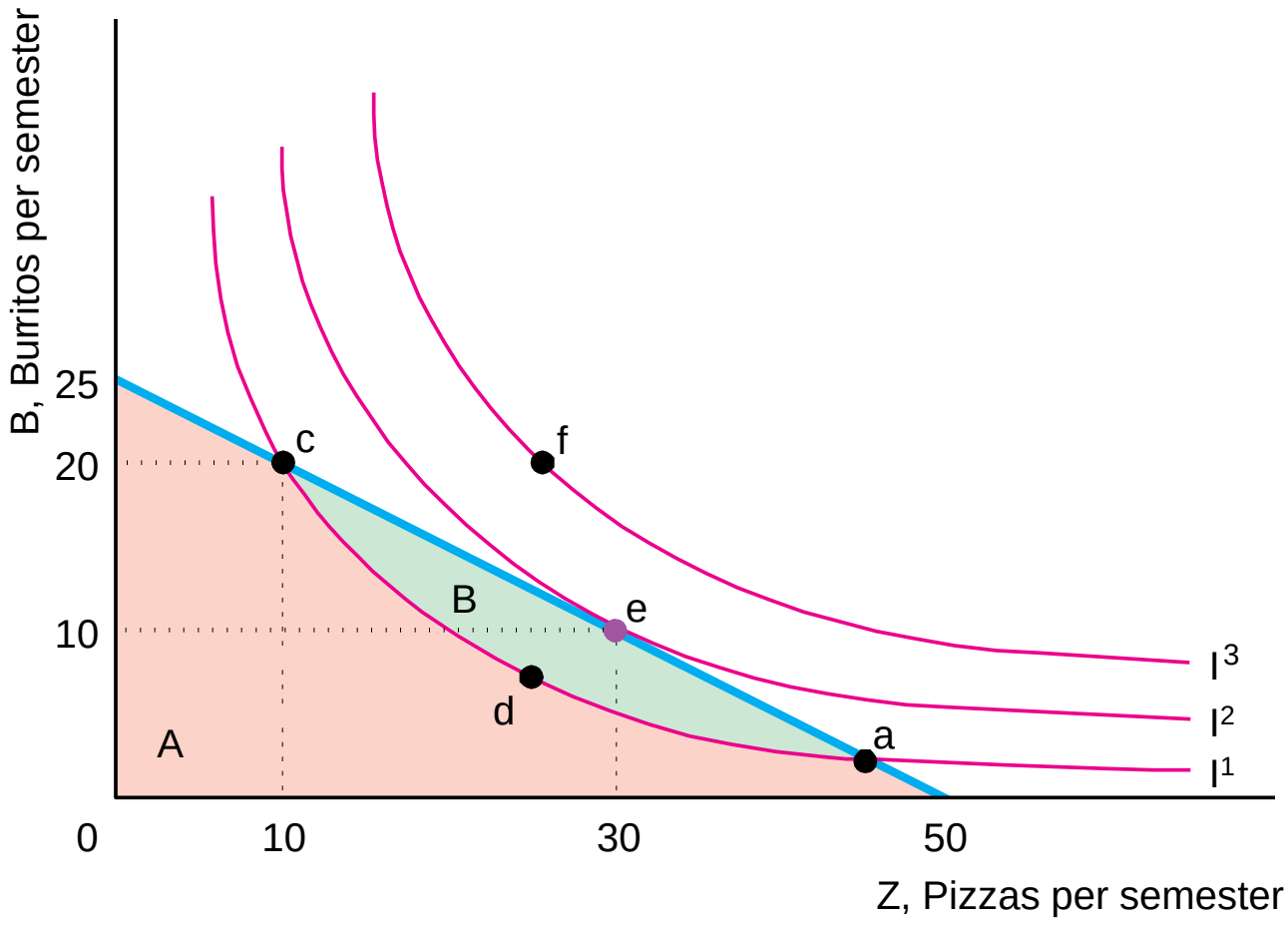


This area represents the new consumption bundles she can now afford!!!

Effect of Rationing



Consumer Maximization



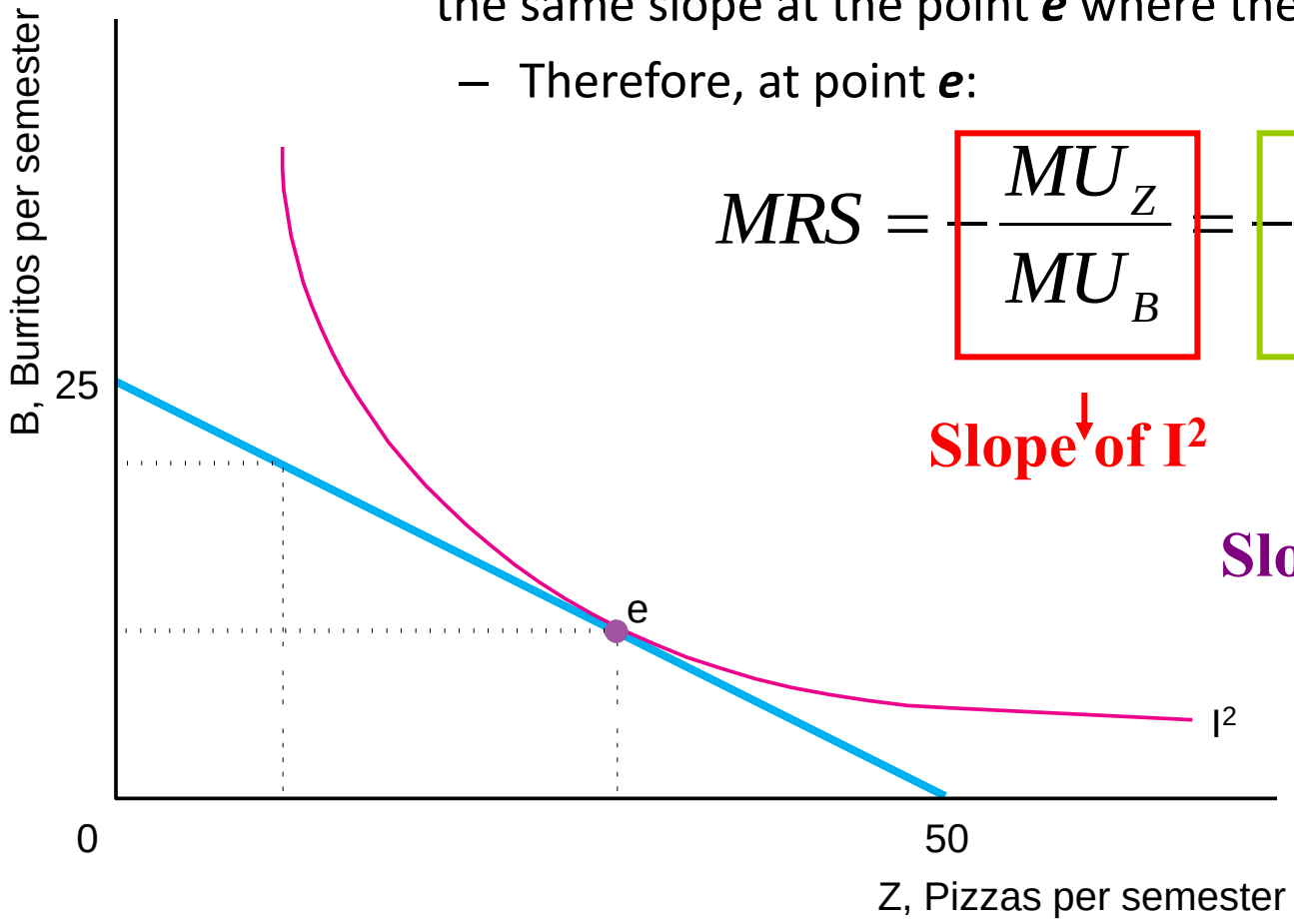
Consumer Maximization: Interior Solution

- The budget constraint and the indifference curve have the same slope at the point ***e*** where they touch.
  - Therefore, at point ***e***:

$$MRS = -\frac{MU_Z}{MU_B} = -\frac{P_Z}{P_B} = MRT$$

Slope of I^2

Slope of BL



Mathematically

$$\max_{x,y} U(x,y)$$

$$s.t.\ \ p_x x + p_y y = m$$

$$\Leftrightarrow L(x,y,\lambda) = U(x,y) - \lambda\left(p_x x + p_y y - m\right)$$

$$foc:$$

$$(i)\ \frac{\partial L}{\partial x} = 0 \Rightarrow \frac{\partial U}{\partial x} - \lambda p_x = 0$$

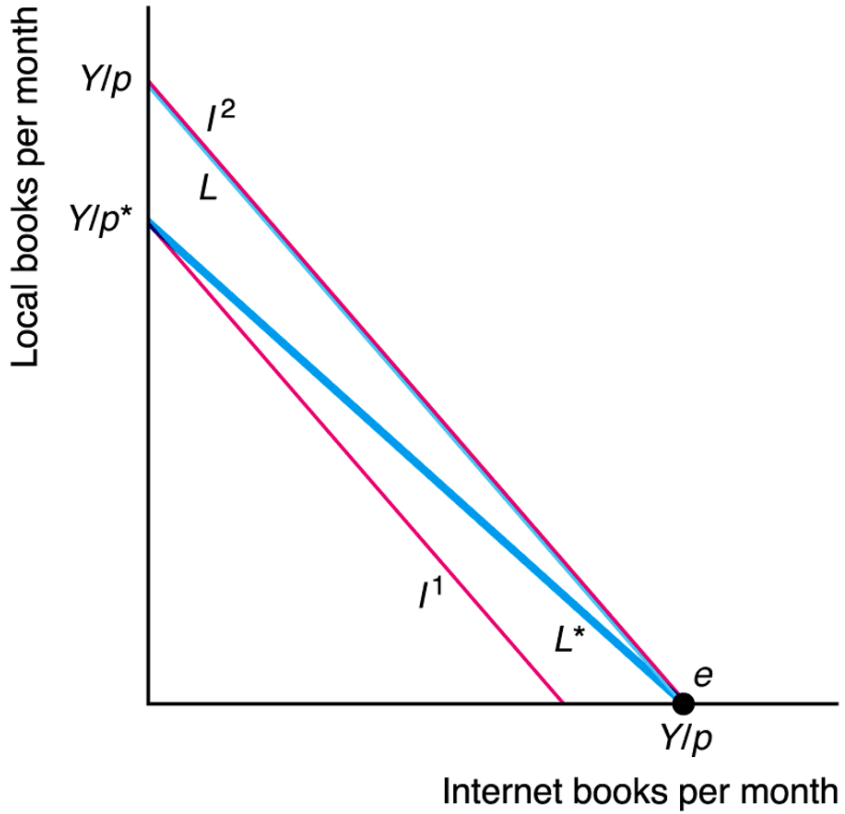
$$(ii)\ \frac{\partial L}{\partial y} = 0 \Rightarrow \frac{\partial U}{\partial y} - \lambda p_y = 0$$

$$(iii)\ \frac{\partial L}{\partial \lambda} = 0 \Rightarrow\ p_x x + p_y y - m = 0$$

Divide (i) by (ii) :

$$\frac{\partial U / \partial x}{\partial U / \partial y} = \frac{p_x}{p_y}$$

Other Types of Optimal Solutions



Optimal Bundles on Convex Sections of Indifference Curves