Consumer Behavior and Utility Maximization

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Montgomery High school
AP Economics

Do Now

- Imagine you are in the supermarket with $10 to spend…What would be in your shopping cart?

UTILITY

Utility

- Utility = want-satisfying power of a good/service
  - Utility ≠ Usefulness
  - Utility is subjective
  - Utility is difficult to quantify (Utils)

Utility: A Tool to Analyze Purchase Decisions

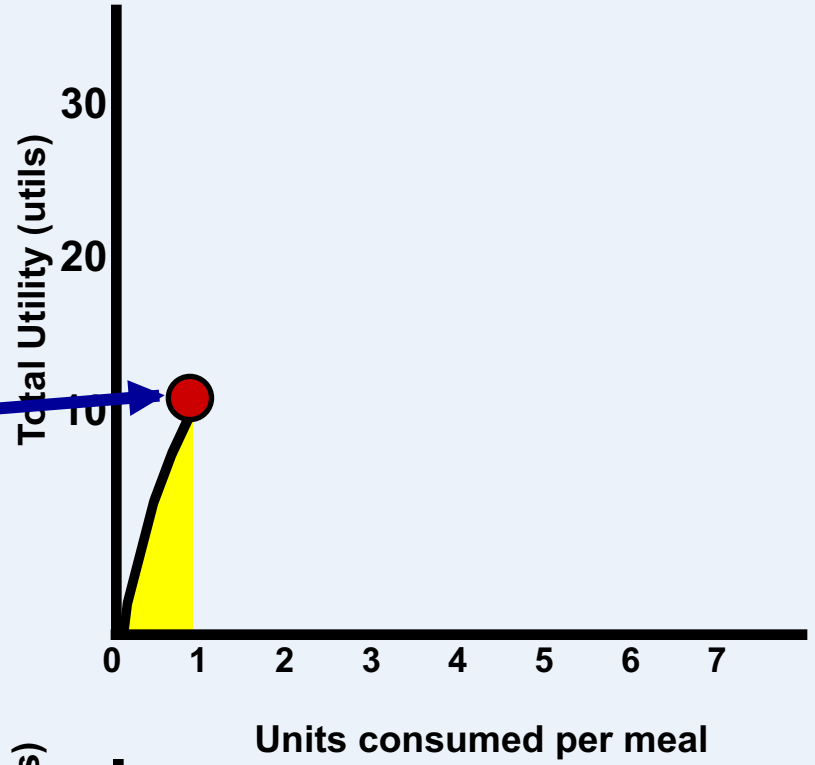
- The Purpose of Utility Analysis
  - The purpose of utility analysis = analyzing how people behave rather than how they think
  - Theory of consumer choice = each consumer spends his or her income in a way that yields the greatest satisfaction
  - Utility = amount of satisfaction

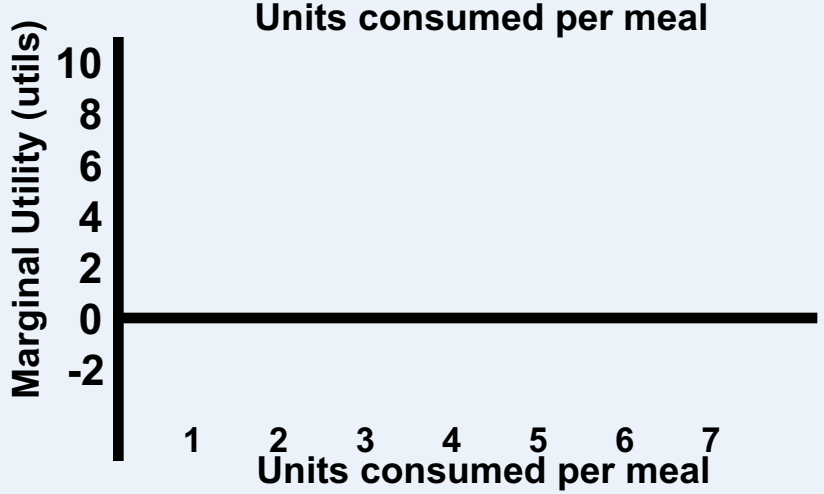
Utility: A Tool to Analyze Purchase Decisions

- Total versus Marginal Utility
  - Total utility = total benefit to a consumer from all the units of a good purchased
  - Marginal utility = extra benefit from the last unit of a good purchased. Also, the change in total utility from the purchase of 1 more unit of the good.
  - ↑ number of goods purchased ⇒ ↑ total utility but a ↓ marginal utility

TOTAL AND MARGINAL UTILITY

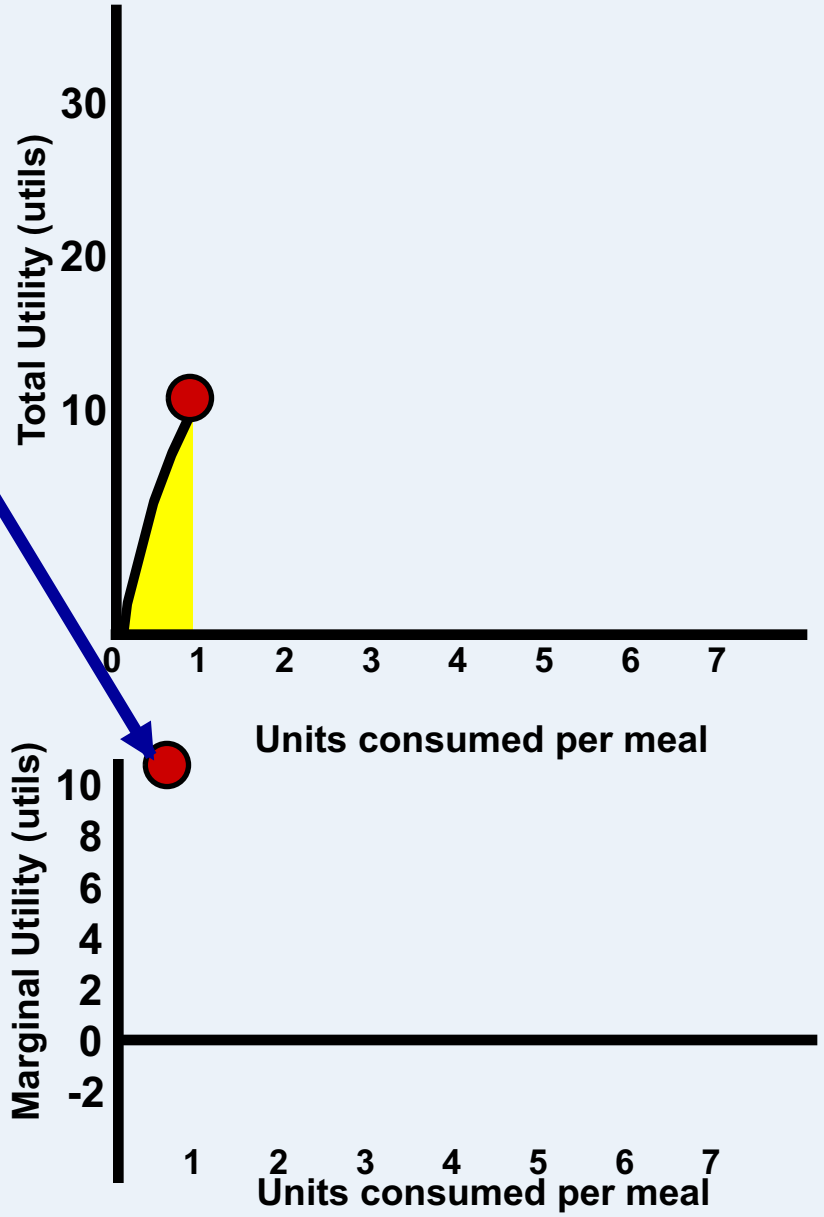
Tacos consumed per meal	Total Utility, Utils	Marginal Utility, Utils
0	0	
1	10	





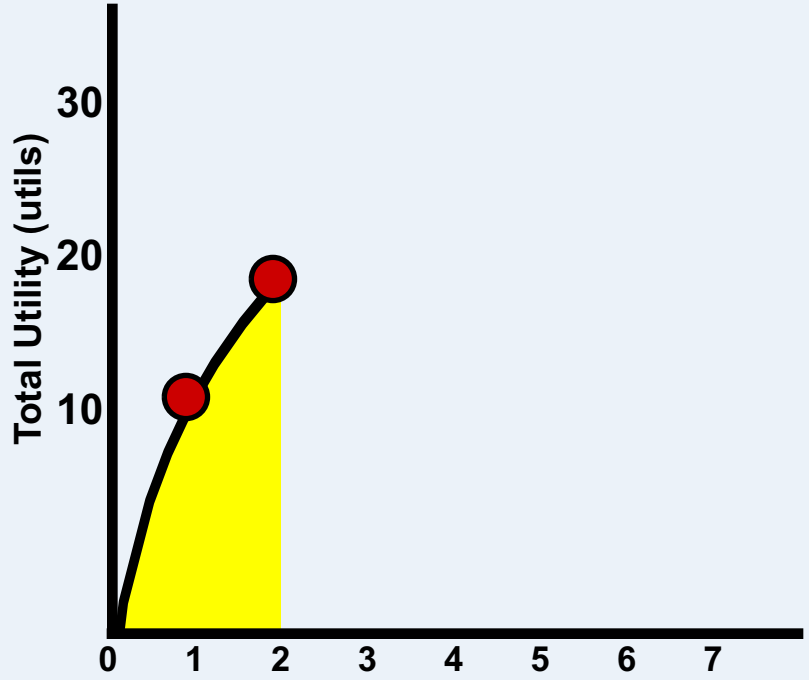
TOTAL AND MARGINAL UTILITY

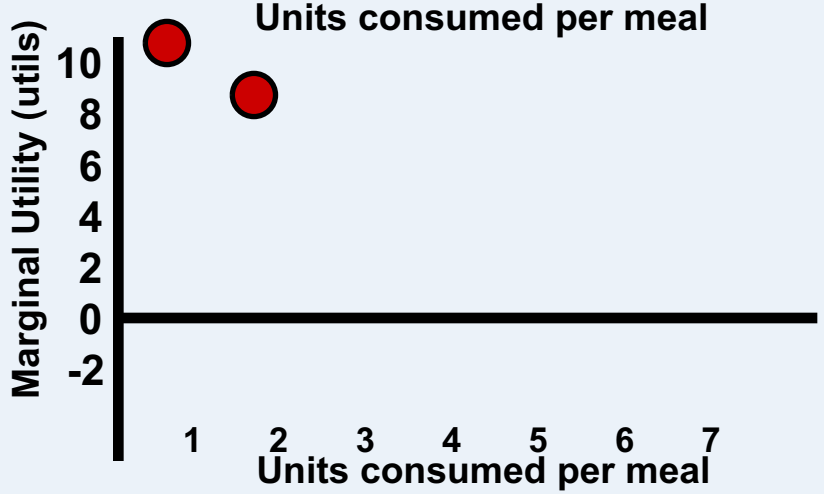
Tacos consumed per meal	Total Utility, Utils	Marginal Utility, Utils
0	0	
1	10	10



TOTAL AND MARGINAL UTILITY

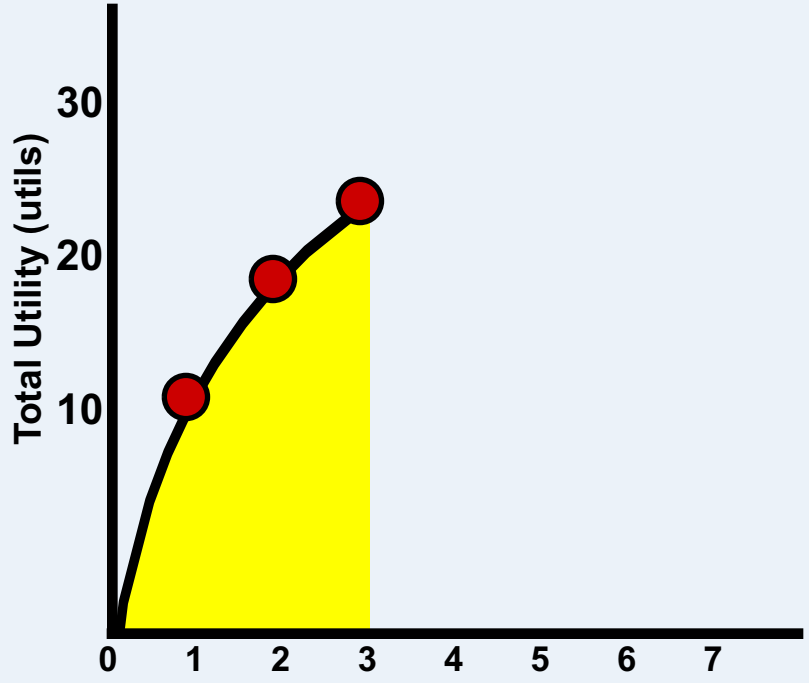
Tacos consumed per meal	Total Utility, Utils	Marginal Utility, Utils
0	0	
		10
1	10	
		8
2	18	

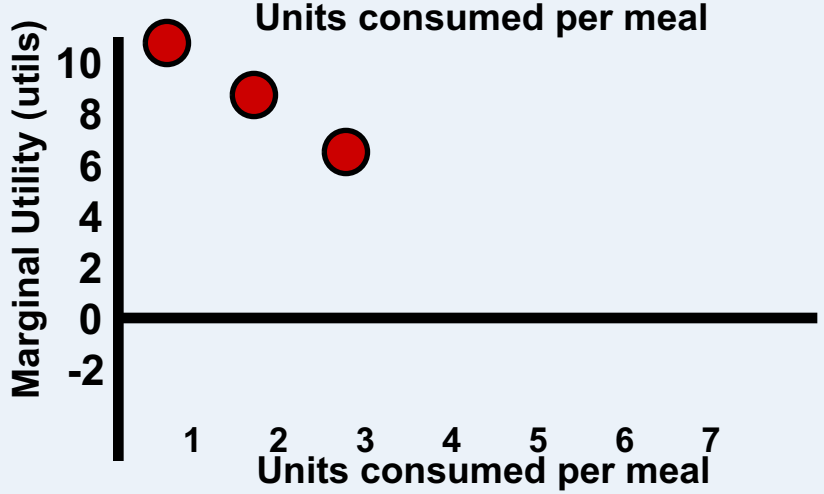




TOTAL AND MARGINAL UTILITY

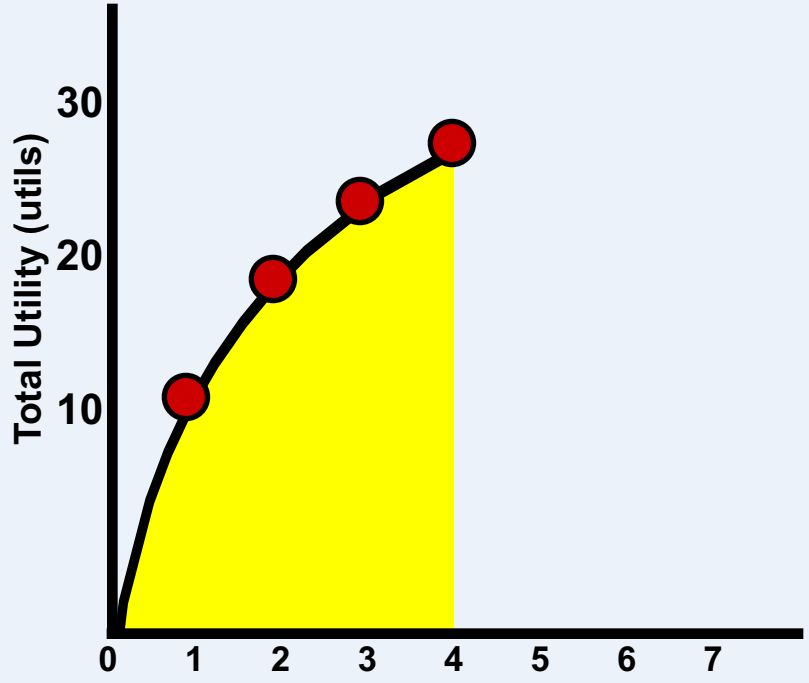
Tacos consumed per meal	Total Utility, Utils	Marginal Utility, Utils
0	0	
		10
1	10	
		8
2	18	
		6
3	24	

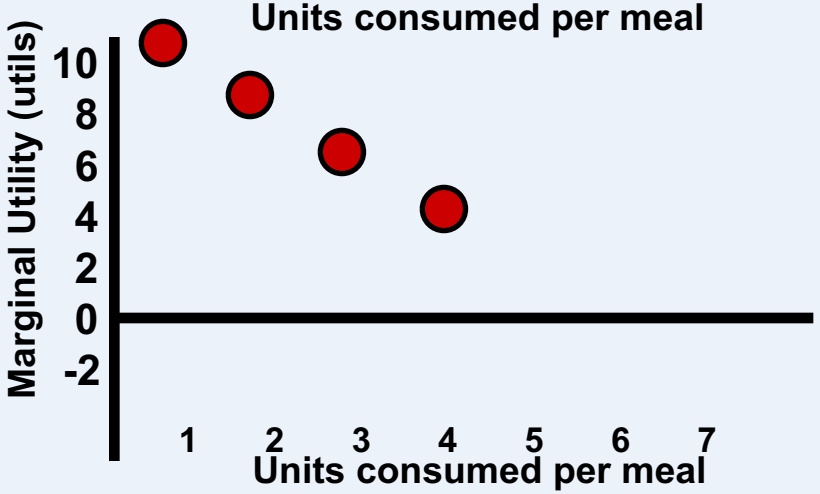




TOTAL AND MARGINAL UTILITY

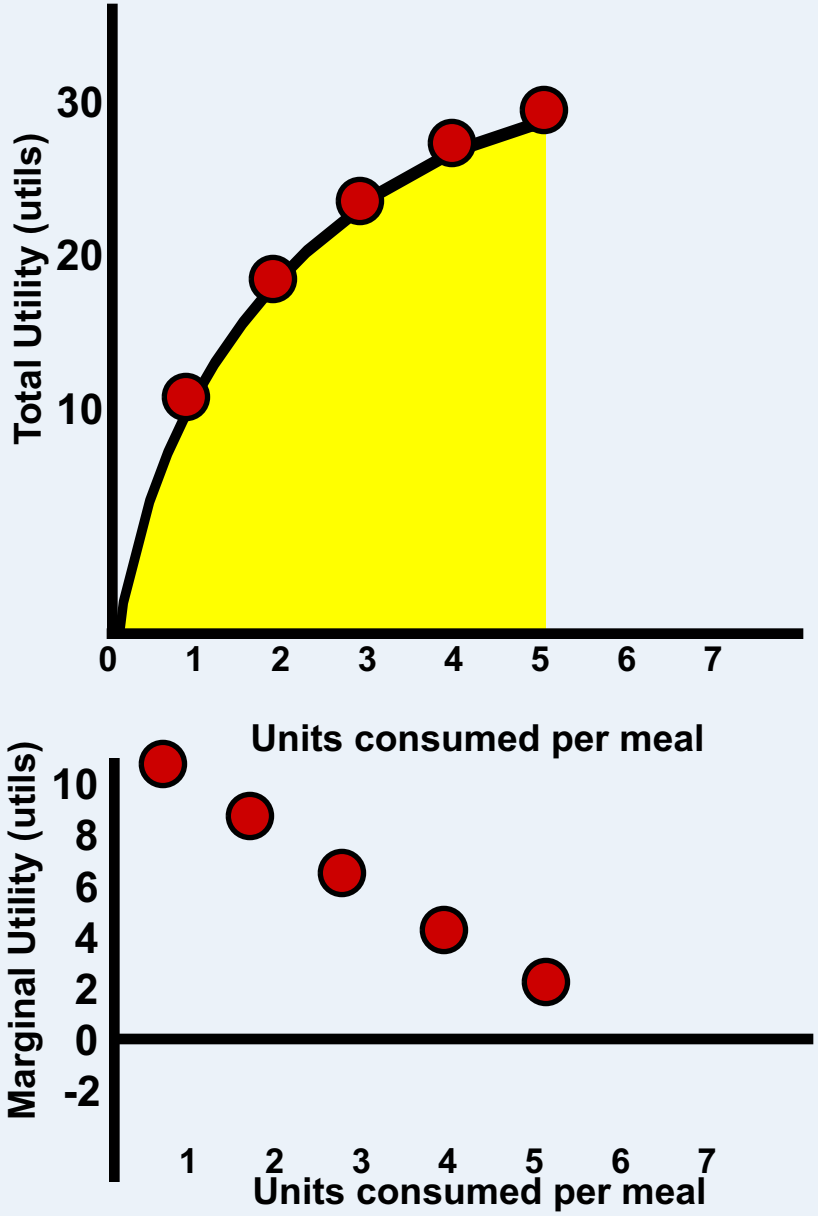
Tacos consumed per meal	Total Utility, Utils	Marginal Utility, Utils
0	0	
		10
1	10	
		8
2	18	
		6
3	24	
		4
4	28	





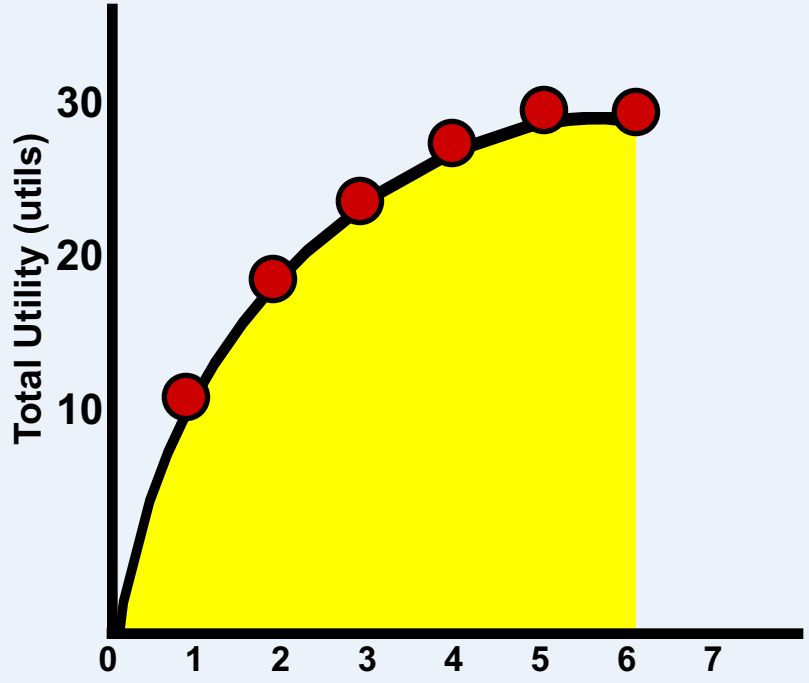
TOTAL AND MARGINAL UTILITY

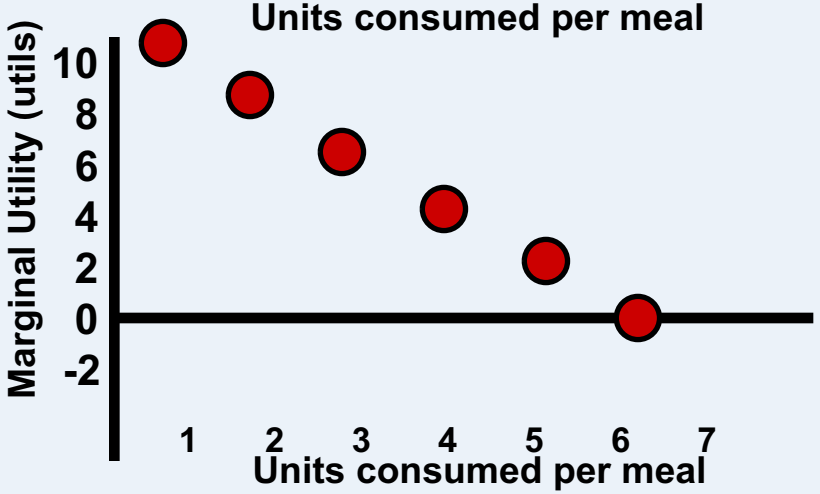
Tacos consumed per meal	Total Utility, Utils	Marginal Utility, Utils
0	0	
		10
1	10	
		8
2	18	
		6
3	24	
		4
4	28	
		2
5	30	



TOTAL AND MARGINAL UTILITY

Tacos consumed per meal	Total Utility, Utils	Marginal Utility, Utils
0	0	
		10
1	10	
		8
2	18	
		6
3	24	
		4
4	28	
		2
5	30	
		0
6	30	





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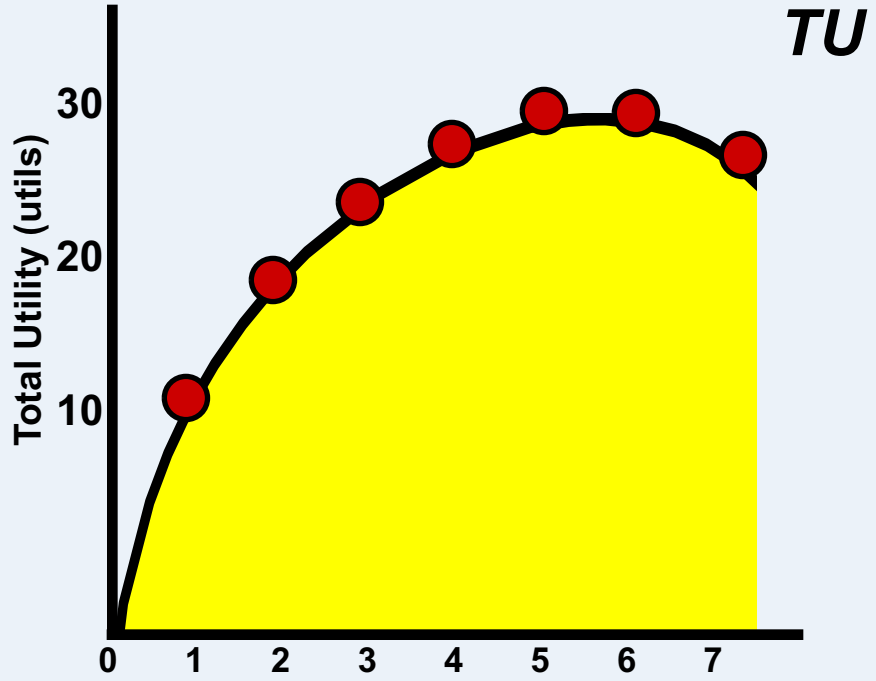
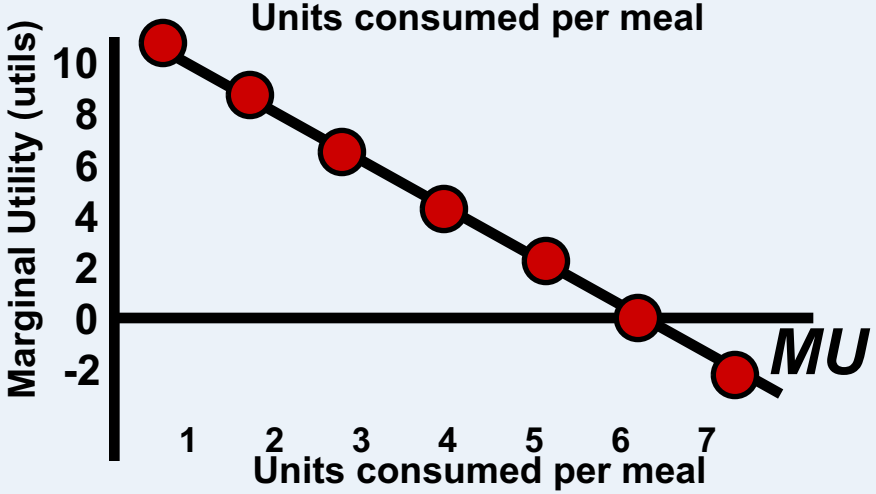
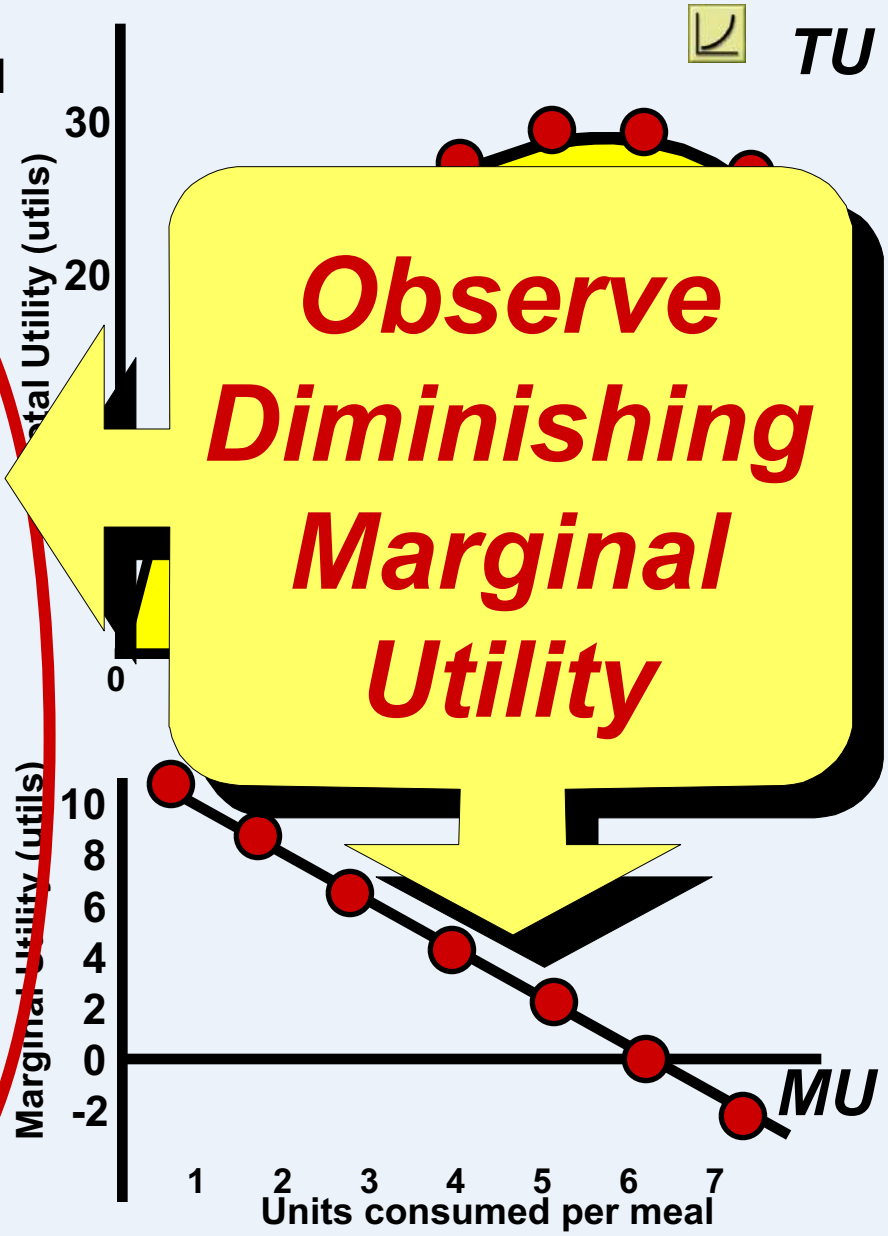
Tacos consumed per meal	Total Utility, Utils	Marginal Utility, Utils
0	0	
		10
1	10	
		8
2	18	
		6
3	24	
		4
4	28	
		2
5	30	
		0
6	30	
		-2
7	28	





TOTAL AND MARGINAL UTILITY

Tacos consumed per meal	Total Utility, Utils	Marginal Utility, Utils
0	0	
1	10	10
2	18	8
3	24	6
4	28	4
5	30	2
6	30	0
7	28	-2



Law of Diminishing Marginal Utility

- Law of diminishing marginal utility: Added satisfaction declines as a consumer acquires additional units of a product.
  - e.g. Your desire for a car may be very strong? What about for a second car? A third?

- Additional units of a good/service are worth less and less to a consumer in money terms.

Using Marginal Utility

- The Optimal Purchase Rule
  - Buy the quantity of each good at which price and marginal utility are exactly equal.
  - If marginal utility is greater (less) than price, the consumer can improve well being by purchasing more (less).

Marginal Utility and Demand

- From Diminishing Marginal Utility to Downward-Sloping Demand Curves
  - Law of diminishing marginal utility $\Rightarrow$ negative slope of demand curves
  - $\uparrow$ price $\Rightarrow$ $\downarrow$ quantity demanded $\Rightarrow$ $\uparrow$ marginal utility
  - Restores equality between price and marginal utility

Marginal Utility and Demand

- From Diminishing Marginal Utility to Downward-Sloping Demand Curves
  - If successive units of a good yield smaller and smaller amounts of extra utility, then the consumer will buy additional units of the good only if its price falls.

THEORY OF CONSUMER BEHAVIOR

Consumer Choice and Budget Constraint

For simplicity, assume the following for the typical consumer:

- ***Rational Behavior – want to maximize total utility***
- ***Clear-cut Preferences***
- ***Budget Constraint (limited income)***
- ***Every good has a price tag***

- ***So, consumers must compromise!***

Consumer Choice as a Trade-Off: Opportunity Cost

- Decision to purchase something $\Rightarrow$ decision to forgo something else

- Opportunity cost of spending an extra dollar on good X = the utility from good Y the purchaser could have gotten by spending that dollar on good Y

THEORY OF CONSUMER BEHAVIOR

Utility Maximizing Rule

The consumer's money income should be allocated so that the last dollar spent on each product yields the same amount of extra (marginal) utility.

illustrated. . .

UTILITY MAXIMIZING COMBINATION

$ 10 income

Unit of product	Product A: Price = $1		Product B: Price = $2	
	Marginal utility, utils	Marginal utility per dollar (MU/price)	Marginal utility, utils	Marginal utility per dollar (MU/price)
First	10	10	24	12

How should the $10 income be allocated?

UTILITY MAXIMIZING COMBINATION

$ 10 income

Unit of product	Product A: Price = $1		Product B: Price = $2	
	Marginal utility, utils	Marginal utility per dollar (MU/price)	Marginal utility, utils	Marginal utility per dollar (MU/price)
First	10	10	24	12

Examine the two marginal utilities

UTILITY MAXIMIZING COMBINATION

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	Marginal utility, utils	Marginal utility per dollar (MU/price)	Marginal utility, utils	Marginal utility per dollar (MU/price)
First	10	10	24	12

Examine the two marginal utilities

…per dollar

UTILITY MAXIMIZING COMBINATION

Unit of product	Product A: Price = $1 Marginal utility, utils	Product A: Price = $1 Marginal utility per dollar (MU/price)	Product B: Price = $2 Marginal utility, utils	Product B: Price = $2 Marginal utility per dollar (MU/price)
First	10	10	24	12 ✓

Decision: Buy 1 Product B for $2

UTILITY MAXIMIZING COMBINATION

$ 10 income

Unit of product	Product A: Price = $1 — *Marginal utility, utils*	Product A: Price = $1 — *Marginal utility per dollar (MU/price)*	Product B: Price = $2 — *Marginal utility, utils*	Product B: Price = $2 — *Marginal utility per dollar (MU/price)*
First	10	10	24	12 ✓
Second	8	8	20	10
Third	7	7	18	9
Fourth	[illegible]	[illegible]	[illegible]	8
Fifth	[illegible]	[illegible]	[illegible]	6
Sixth	[illegible]	[illegible]	[illegible]	3
Seventh	3	3	4	2

What next?

UTILITY MAXIMIZING COMBINATION

$ 10 income

Unit of product	Product A: Price = $1 Marginal utility, utils	Product A: Price = $1 Marginal utility per dollar (MU/price)	Product B: Price = $2 Marginal utility, utils	Product B: Price = $2 Marginal utility per dollar (MU/price)
First	10	10 ✓	24	12 ✓
Second	8	8	20	10 ✓
Third	7	7	18	9
Fifth	5	5	8	4
Six	4	4	6	3
Seventh	3	3	4	2

What next?

Buy one of each

UTILITY MAXIMIZING COMBINATION

$ 10 income

Unit of product	Product A: Price = $1 Marginal utility, utils	Product A: Price = $1 Marginal utility per dollar (MU/price)	Product B: Price = $2 Marginal utility, utils	Product B: Price = $2 Marginal utility per dollar (MU/price)
First	10	10 ✓	24	12 ✓
Second	8	8	20	10 ✓
Third	7	7	18	9
Fo				8
				6
				3
Seventh			4	2

and then...
($5 left)

UTILITY MAXIMIZING COMBINATION

$ 10 income

Unit of product	Product A: Price = $1 Marginal utility, utils	Product A: Price = $1 Marginal utility per dollar (MU/price)	Product B: Price = $2 Marginal utility, utils	Product B: Price = $2 Marginal utility per dollar (MU/price)
First	10	10 ✓	24	12 ✓
Second	8	8	20	10 ✓
Third	7	7	18	9 ✓
Fou				8
				6
				3
Seventh			4	2

third unit of product B

UTILITY MAXIMIZING COMBINATION

$ 10 income

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First	10	10 ✓	24	12 ✓
Second	8	8	20	10 ✓
Third	7	7	18	9
			16	8
			12	6
			6	3
Seventh	3	3	4	2

$3 left...

UTILITY MAXIMIZING COMBINATION

$ 10 income

Unit of product	Product A: Price = $1 Marginal utility, utils	Product A: Price = $1 Marginal utility per dollar (MU/price)	Product B: Price = $2 Marginal utility, utils	Product B: Price = $2 Marginal utility per dollar (MU/price)
First	10	10 ✓	24	12 ✓
Second	8	8 ✓	20	10 ✓
Third	7	7	18	9 ✓
			16	8 ✓
			12	6
			6	3
Seventh	3	3	4	2

$3 left...

Buy both!

UTILITY MAXIMIZING COMBINATION

$ 10 income

Unit of product	Product A: Price = $1 Marginal utility, utils	Product A: Price = $1 Marginal utility per dollar (MU/price)	Product B: Price = $2 Marginal utility, utils	Product B: Price = $2 Marginal utility per dollar (MU/price)
First	10	10 ✓	24	12 ✓
Second	8	8 ✓	20	10 ✓
			18	9
			16	8 ✓
			12	6
			6	3
Seventh	3	3	4	2

Income is gone...
the last dollar spent on each good gave the same utility (8) per dollar

UTILITY MAXIMIZING COMBINATION

Algebraic Restatement of the Utility Maximization Rule

$$\frac{\text{MU of product A}}{\text{Price of A}} = \frac{\text{MU of product B}}{\text{Price of B}}$$

$$\frac{8 \text{ Utils}}{\$1} = \frac{16 \text{ Utils}}{\$2}$$

UTILITY MAXIMIZATION AND THE DEMAND CURVE

Deriving the Demand Schedule and Curve

Recall our basic determinants of demand:

- **Preferences or Tastes**
- **Money Income**
- **Prices of Other Goods**

UTILITY MAXIMIZATION AND THE DEMAND CURVE

Deriving the Demand Schedule and Curve

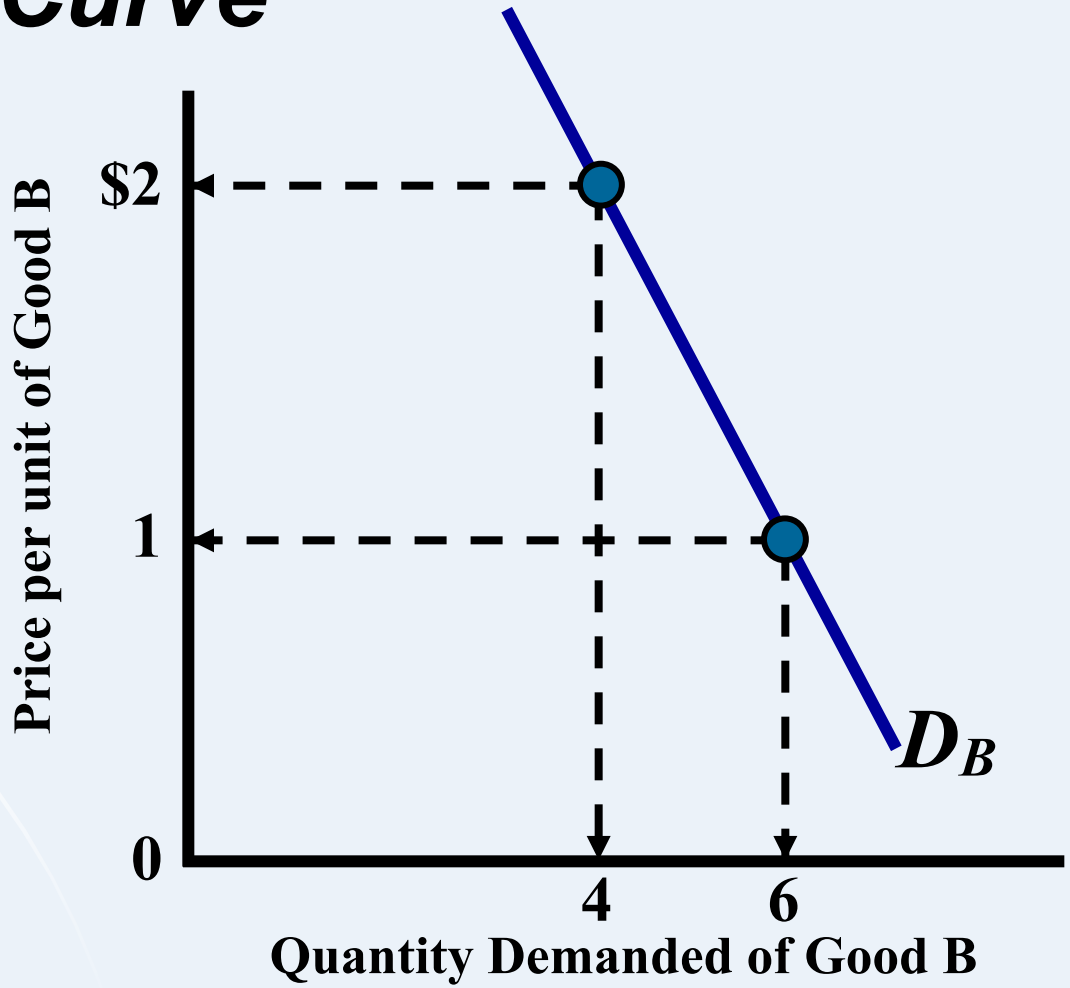
Create a demand schedule from the purchase decisions as the price of the product is varied ...

Price per unit of B	*Quantity Demanded*
$2	4
1	6

Graphically . . .

UTILITY MAXIMIZATION AND THE DEMAND CURVE

Deriving the Demand Schedule and Curve



UTILITY MAXIMIZATION AND THE DEMAND CURVE

Deriv th om l Schedule

Income and Substitution Effects Revisited

THE LAW OF DEMAND

A Closer Look…

The Income Effect

A lower price increases real income (purchasing power) - and vice versa

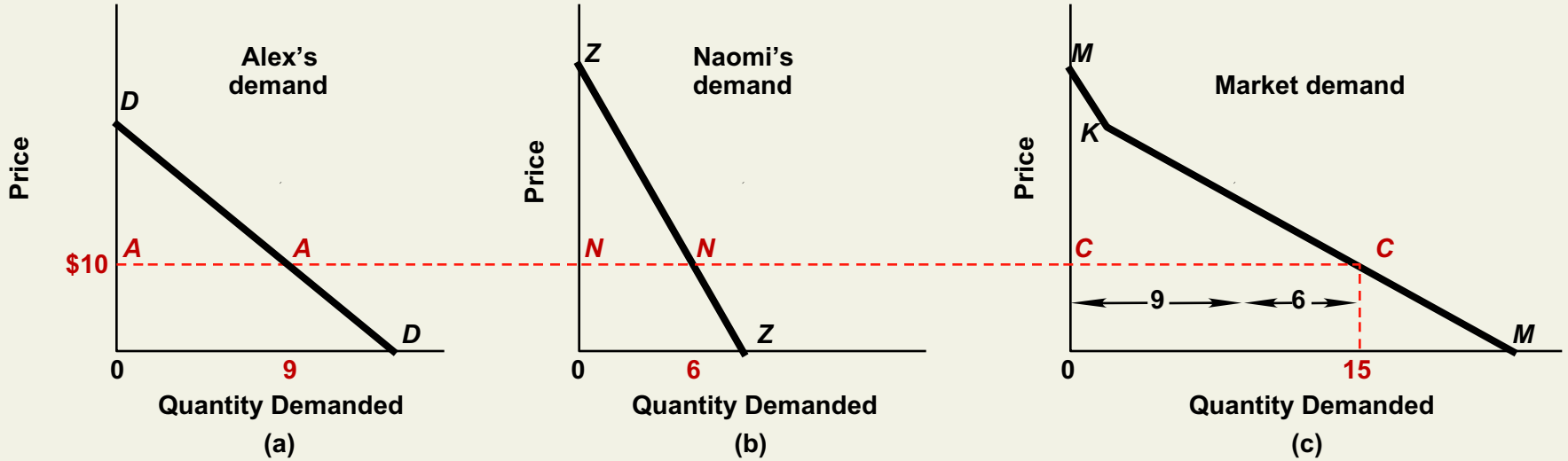
The Substitution Effect

A lower price relative to other goods attracts new buyers - and vice versa

From Individual to Market Demand Curves

- Market Demand as a Horizontal Sum
  - Market demand curve = the horizontal sum of the individual demand curves
- The “Law” of Demand
  - Negative slope for market demand curves
    - Individual demand curves usually have negative slopes
    - Lower price draws new customers into the market

Total Market Demand vs. Individual Consumer Demand



APPLICATIONS AND EXTENSIONS

- ***iPods***
  - ***How do they compare to portable CD players?***
  - ***How much would you value a second iPod? A third?***
  - ***How do Apple's continued enhancements entice buyers?***

- ***Cash vs. Noncash Gifts***
  - ***Which do you prefer? Why?***

Consumer Surplus

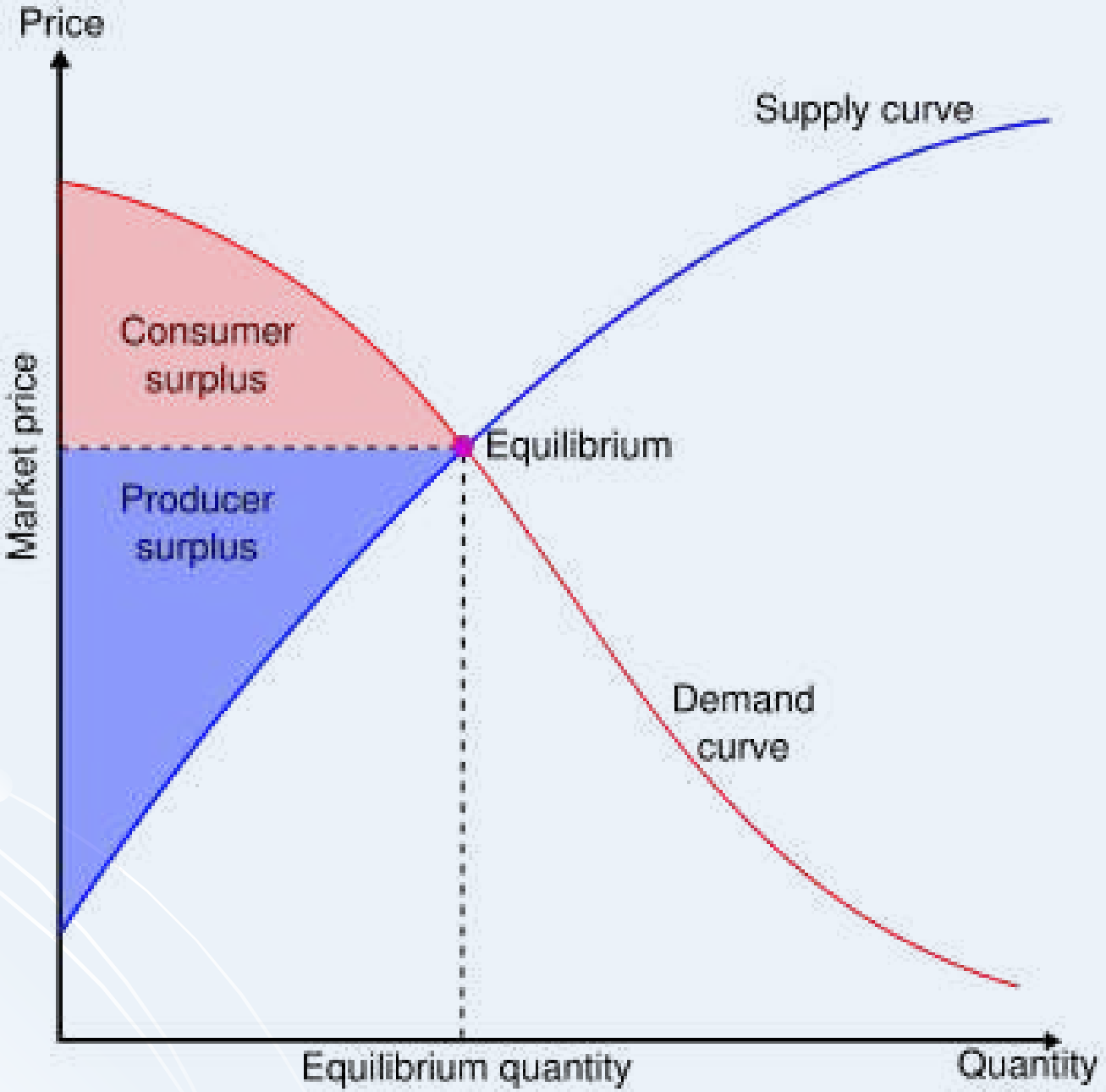
- Voluntary purchase $\Rightarrow$ benefit > costs
- Consumer surplus = net benefit to the buyer

- Consumer Surplus = the difference between the maximum price a consumer is (or consumers are) willing to pay for a product and the price that they actually pay

Producer Surplus

- Producer Surplus = the difference between the actual price a producer receives (or producers receive) and the minimum acceptable price.

- Graphically, it is the area that lies above the supply curve and below the price line up to the quantity sold.


Price
Supply curve
Consumer surplus
Market price
Equilibrium
Producer surplus
Demand curve
Equilibrium quantity
Quantity

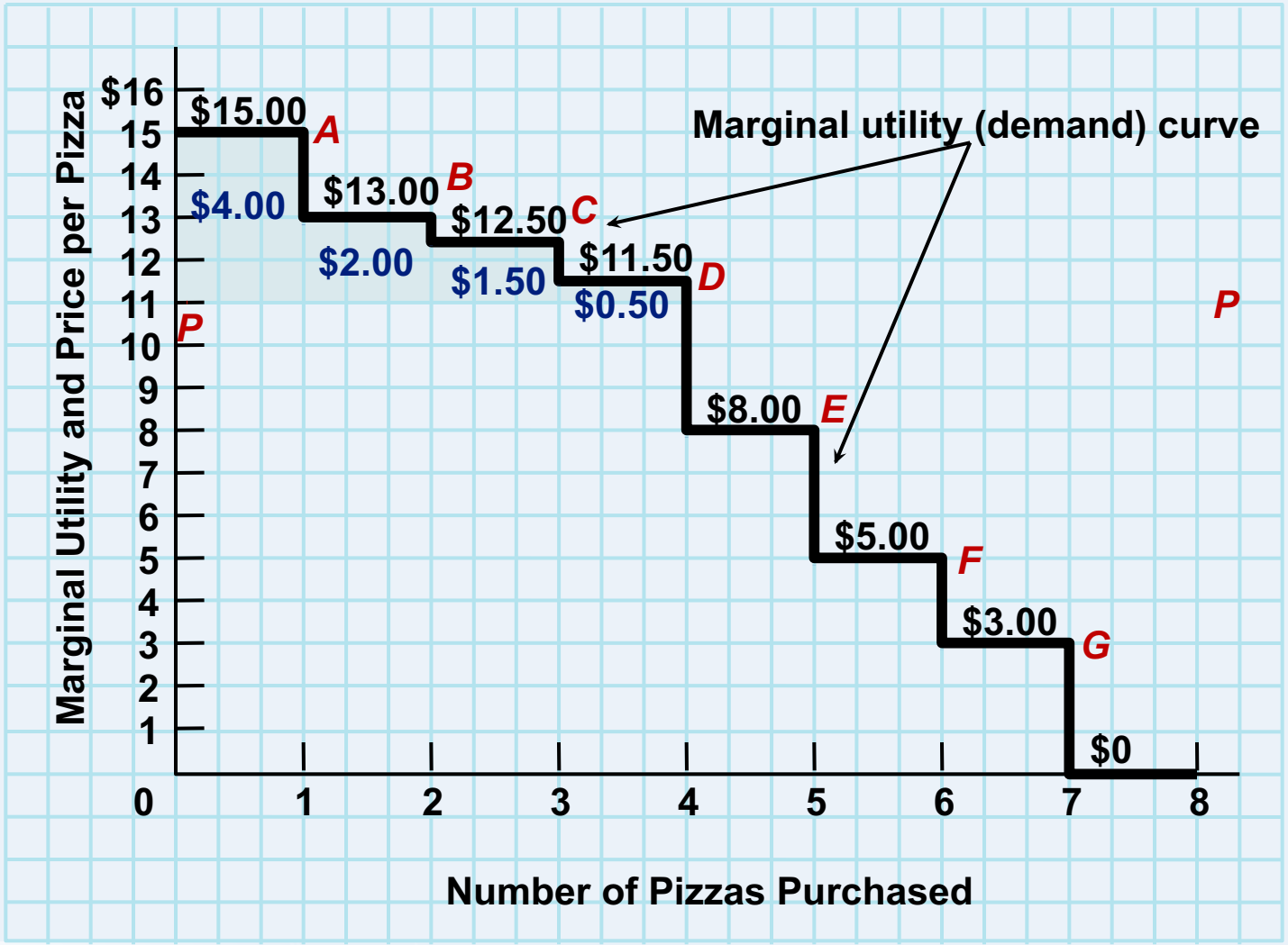
Calculating Marginal Net Utility (Surplus)

TABLE 3

Calculating Marginal Net Utility (Consumer's Surplus) from Your Pizza Purchases

Quantity	Marginal Utility	Price	Marginal Net Utility (Surplus)
0			
	\$15.00	\$11.00	\$4.00
1			
	13.00	11.00	2.00
2			
	12.50	11.00	1.50
3			
	11.50	11.00	0.50
4			
Total			\$8.00

Graphic Calculation of Consumer's Surplus

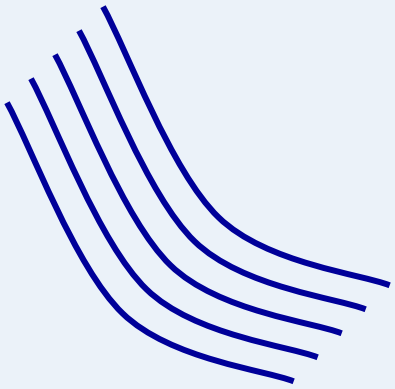


Resolving the Diamond-Water Paradox

- Diamonds are unnecessary, but scarce $\Rightarrow$ high price and high marginal utility
- Water is necessary, but plentiful $\Rightarrow$
- low price and low marginal utility

- Given the enormous amounts of water consumed, the total utility derived from water is much greater than from diamonds. But, the relative prices relate to marginal (not total) utility.

Indifference Curve Analysis



Geometry of Available Choices: The Budget Line

- Budget line
  - Graphical representation of all possible combinations of a household's purchases of two goods, given their prices and a fixed amount of money to spend
- Properties of the Budget Line
  - Represents the maximum amounts of the goods the consumer can afford

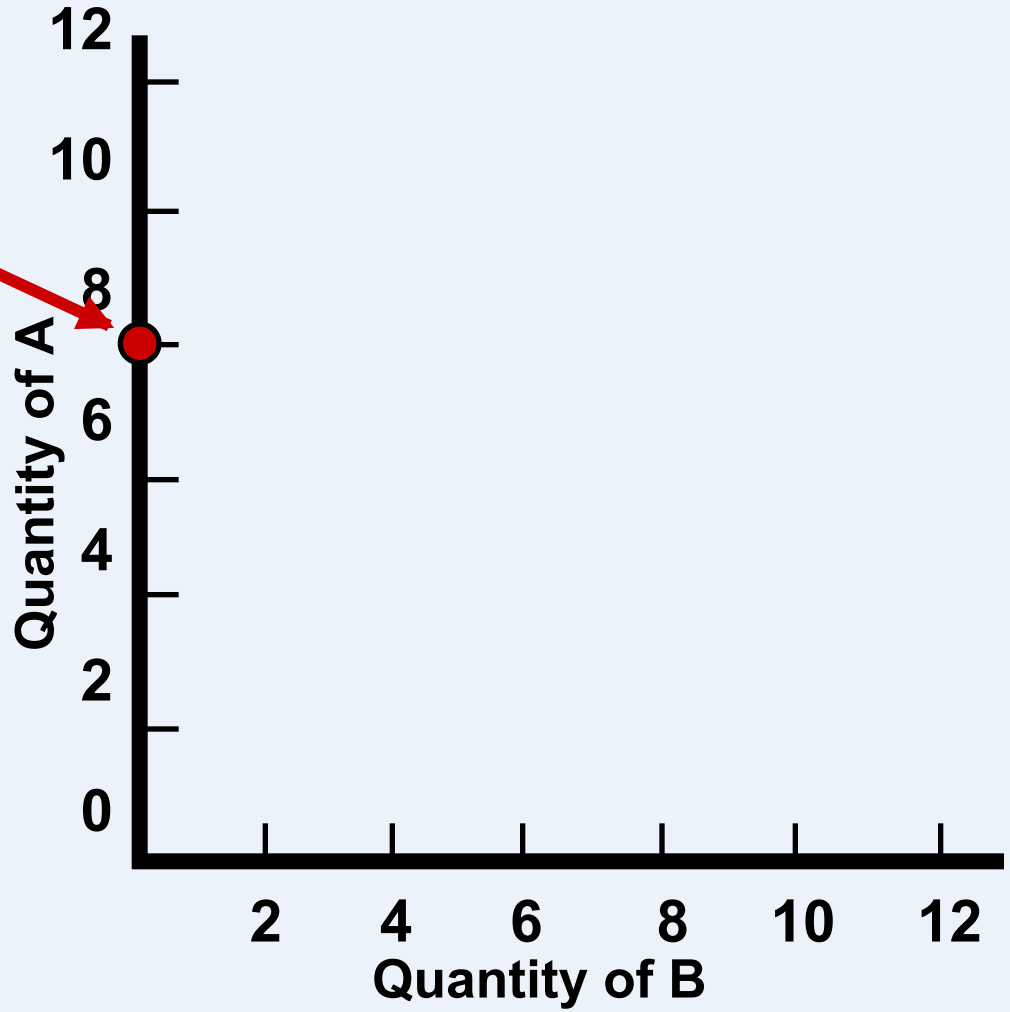
Geometry of Available Choices: The Budget Line

- Changes in the Budget Line
  - Δ income $\Rightarrow$ parallel shift in the budget line
  - Δ relative prices of the goods $\Rightarrow$ Δ slope of the budget line

THE BUDGET LINE:

What is Attainable

Units of A Price $1.50	Units of B Price $1.00	Total Expenditures
8	0	$12
6	3	12
4	6	12
2	9	12
0	12	12



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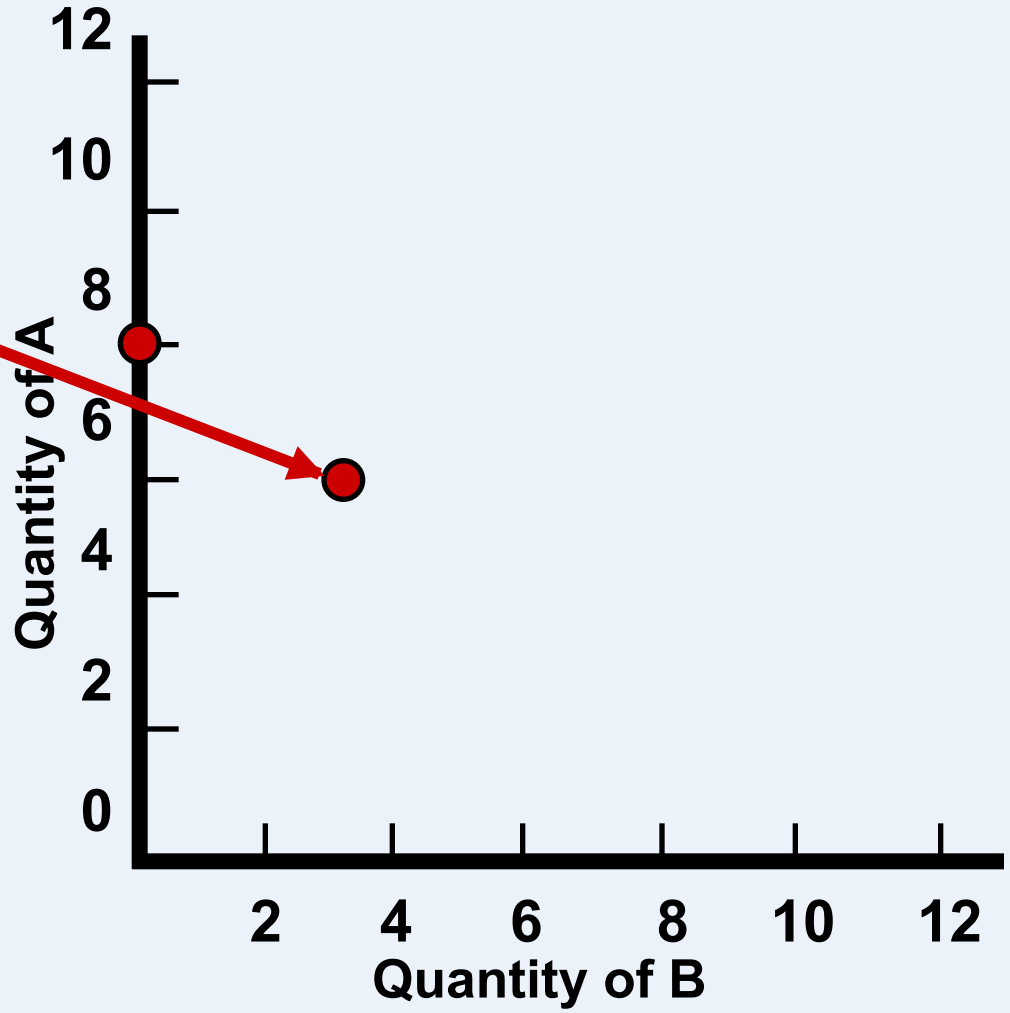

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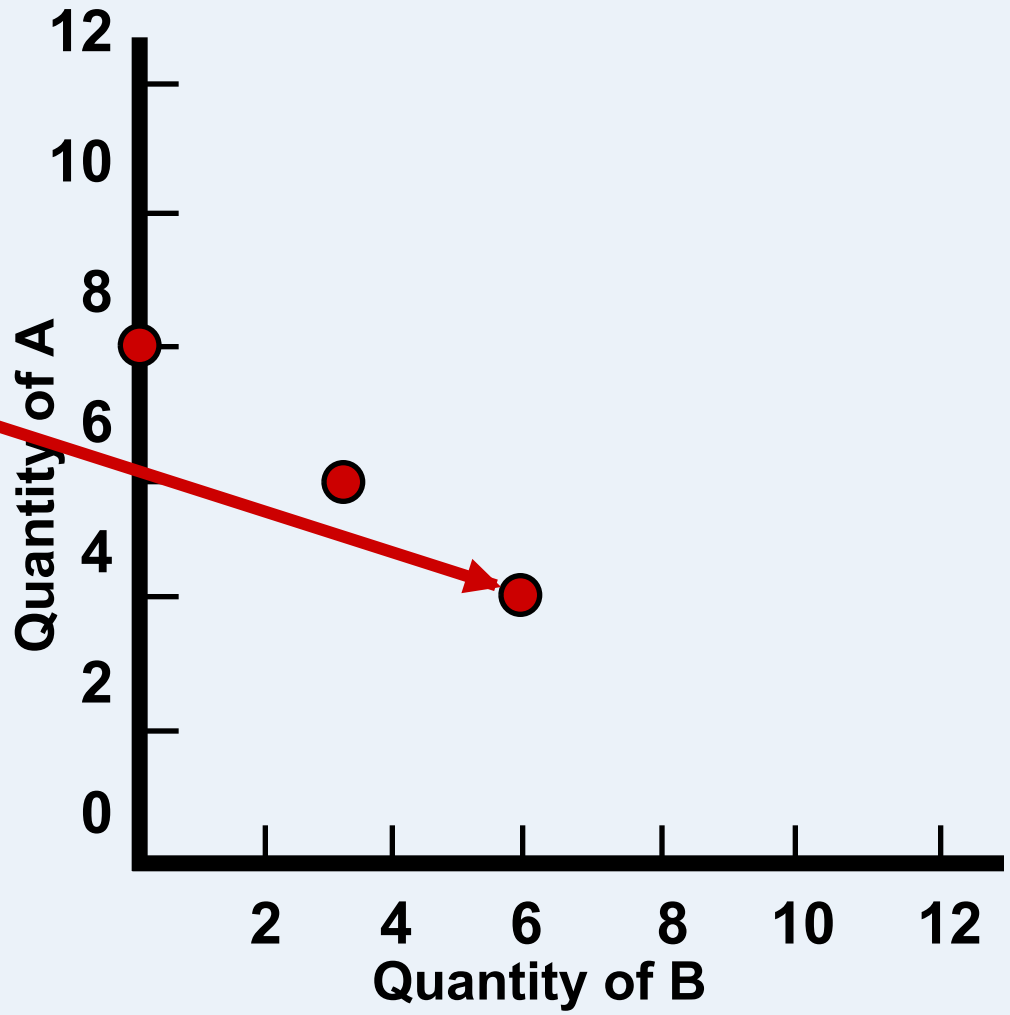

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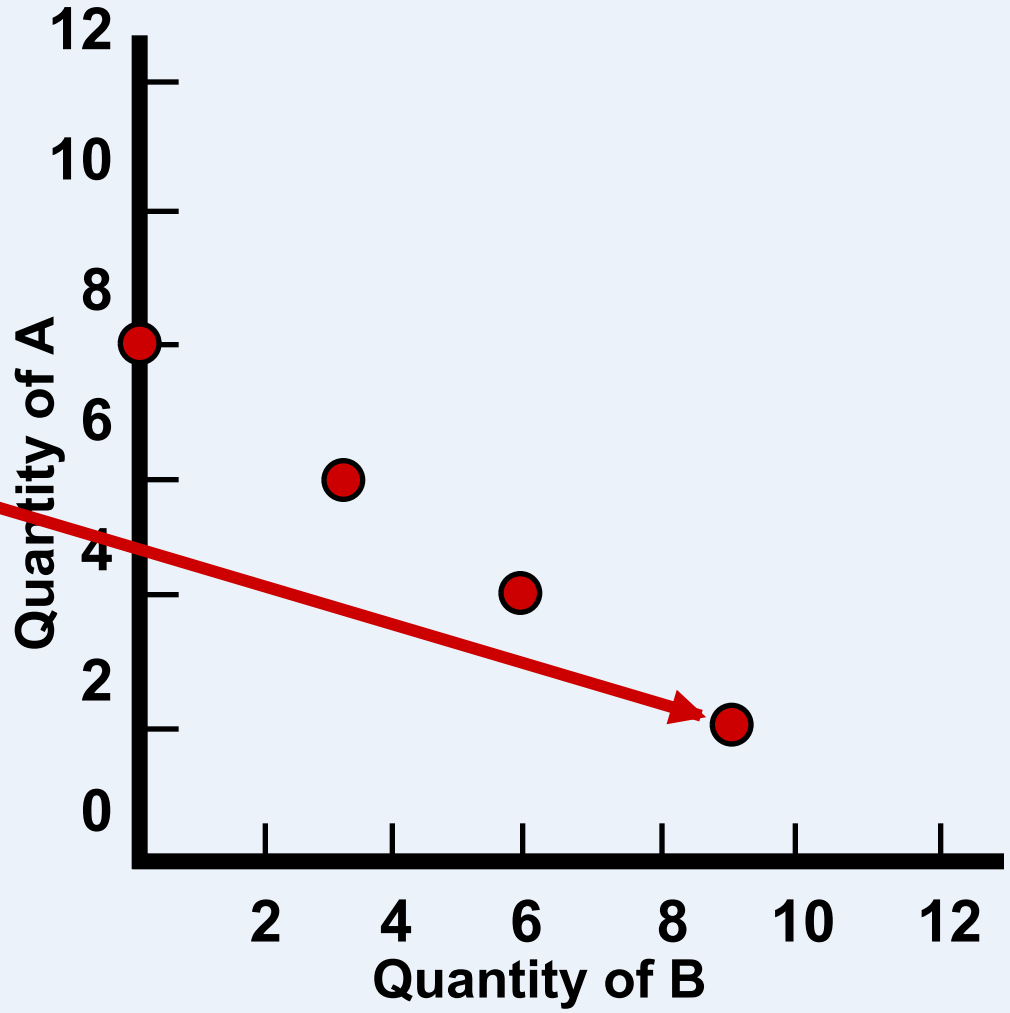
4	6	12
2	9	12
0	12	12



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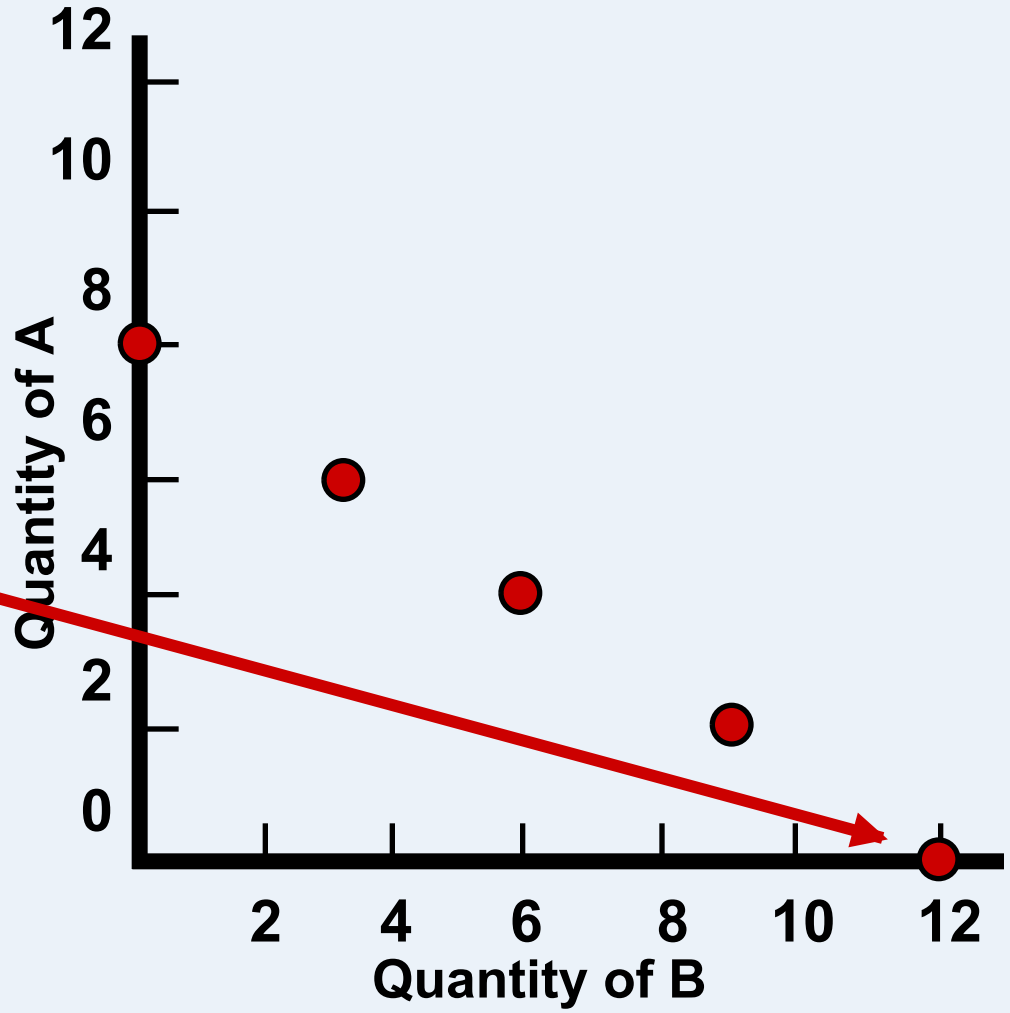

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What is Attainable

Units of A Price $1.50	Units of B Price $1.00	Total Expenditures
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6	3	12
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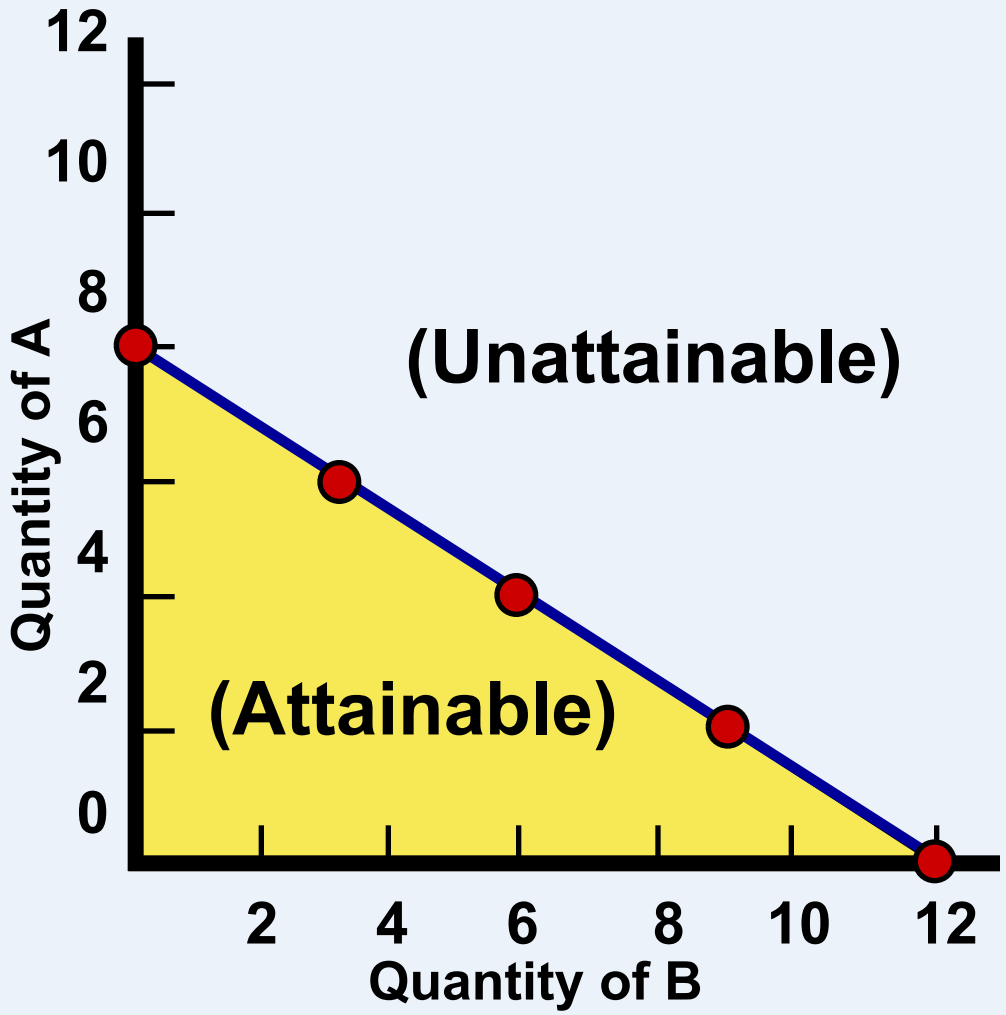
2	9	12
0	12	12

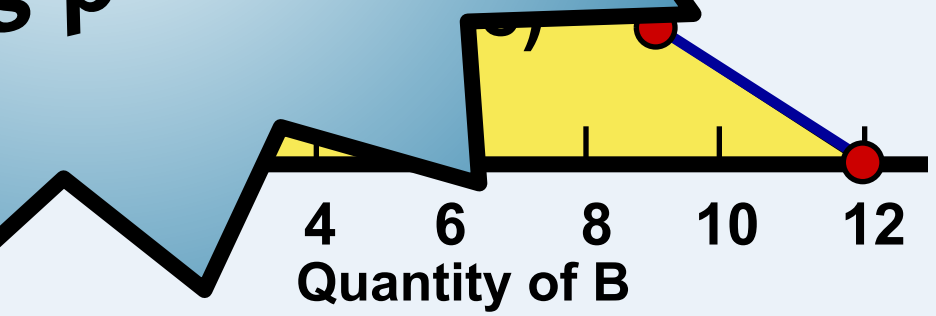


THE BUDGET LINE:

What is Attainable

Units of A Price $1.50	Units of B Price $1.00	Total Expenditure
8	0	
4		

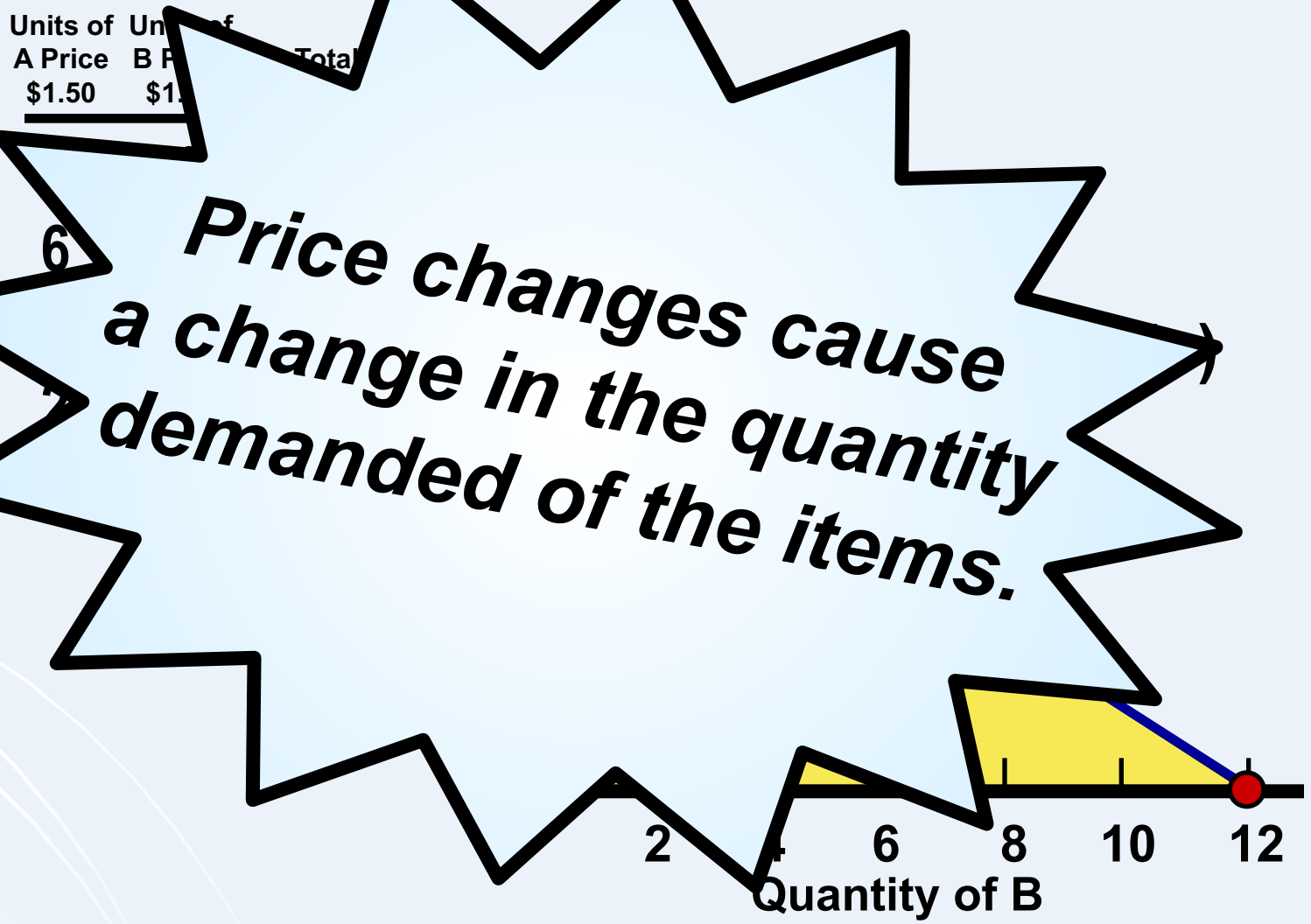
An Increase in income makes the purchase of more of either or both items possible.



THE BUDGET LINE:

What is Attainable

Price changes cause a change in the quantity demanded of the items.



Properties of the Indifference Curve

- Indifference curve = a line connecting all combinations of the goods that are equally desirable
- Properties of the indifference curve:
  - higher is better
  - never intersect
  - negative slope
  - bowed in (convex)

The Slopes of Indifference Curves and Budget Lines

- Slope of the indifference curve = marginal rate of substitution of the two goods
- The slope of the budget line = relative prices of the two goods

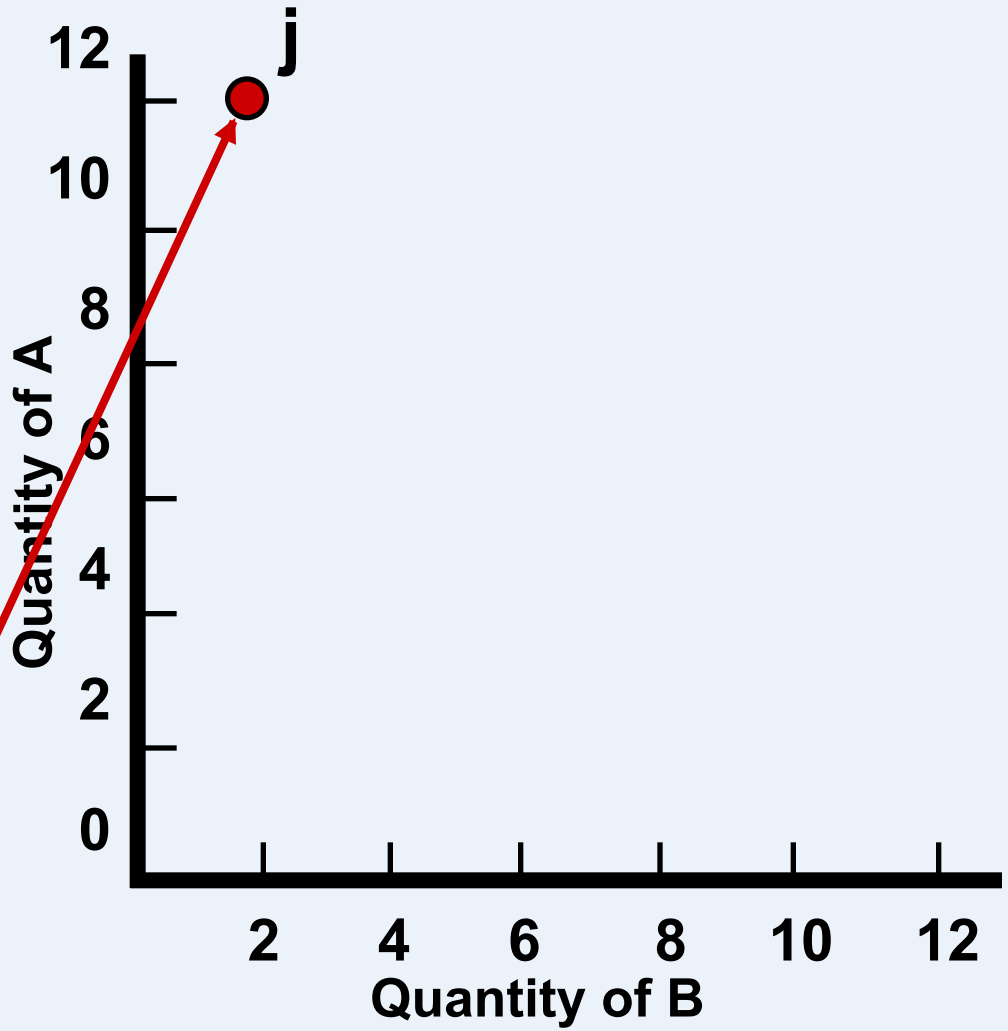
INDIFFERENCE CURVES

What is Preferred

Units of A Price $1.50	Units of B Price $1.00	Total Expenditures
8	0	$12
6	3	12
4	6	12
2	9	12
0	12	12

An Indifference Schedule

Combi-nation	Units of A	Units of B
j	12	2



INDIFFERENCE CURVES

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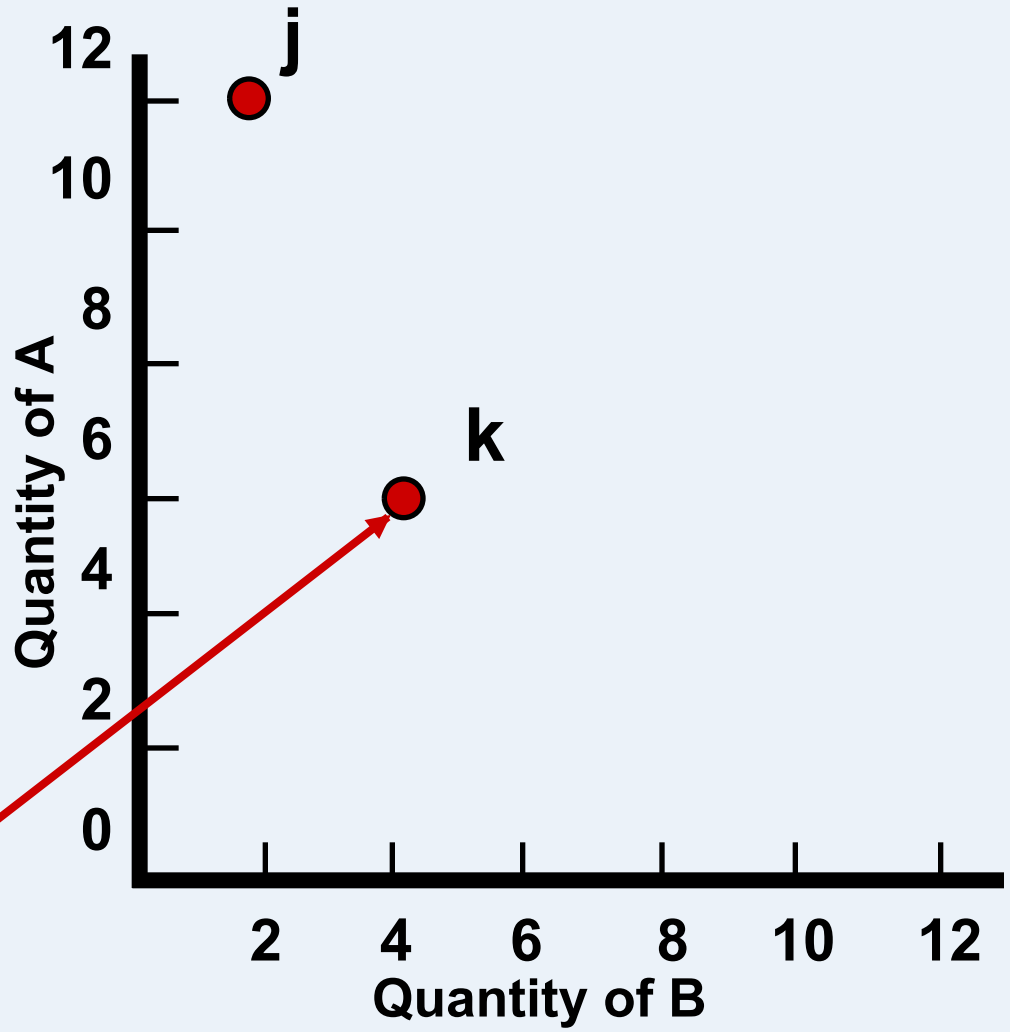
2	9	12
0	12	12

An Indifference Schedule

Combi-nation	Units of A	Units of B
j	12	2
k	6	4



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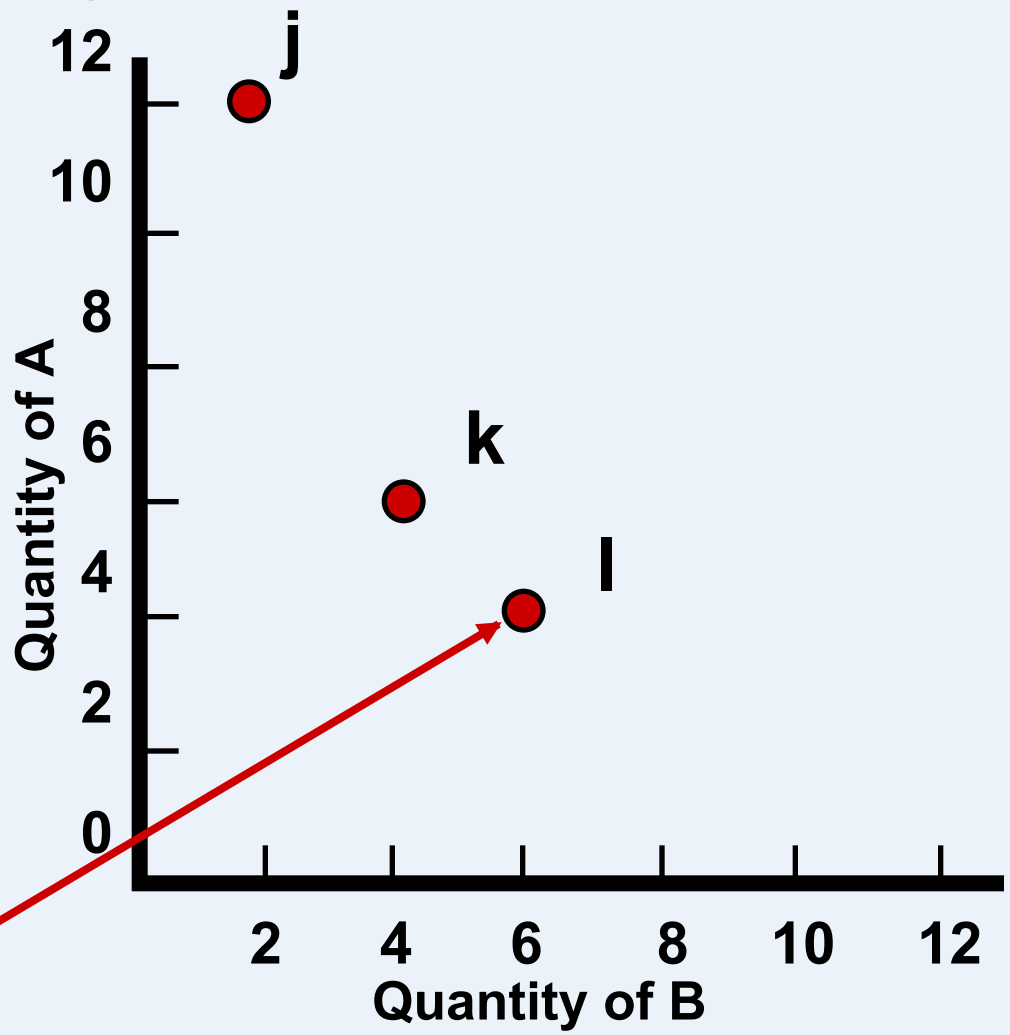

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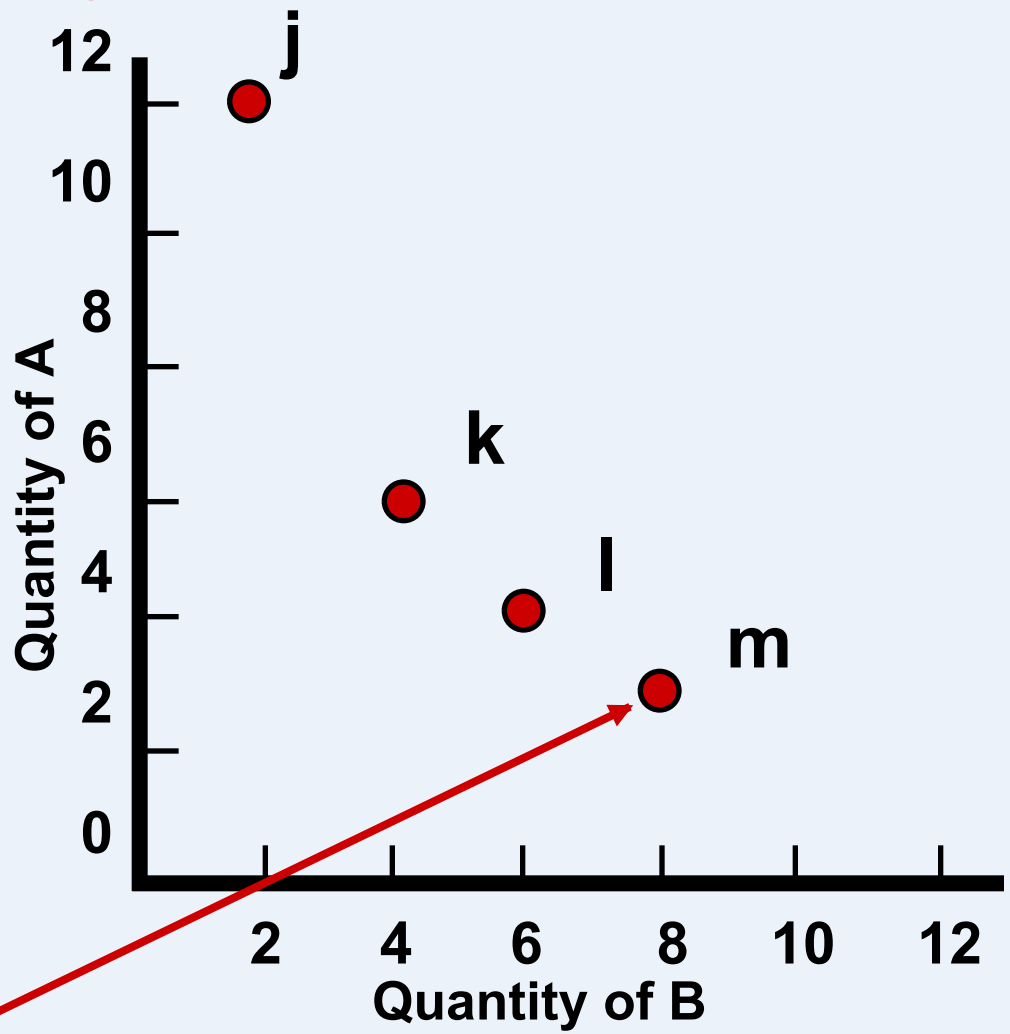
An Indifference Schedule

Combi-nation	Units of A	Units of B
j	12	2
k	6	4
l	4	6
m	3	8



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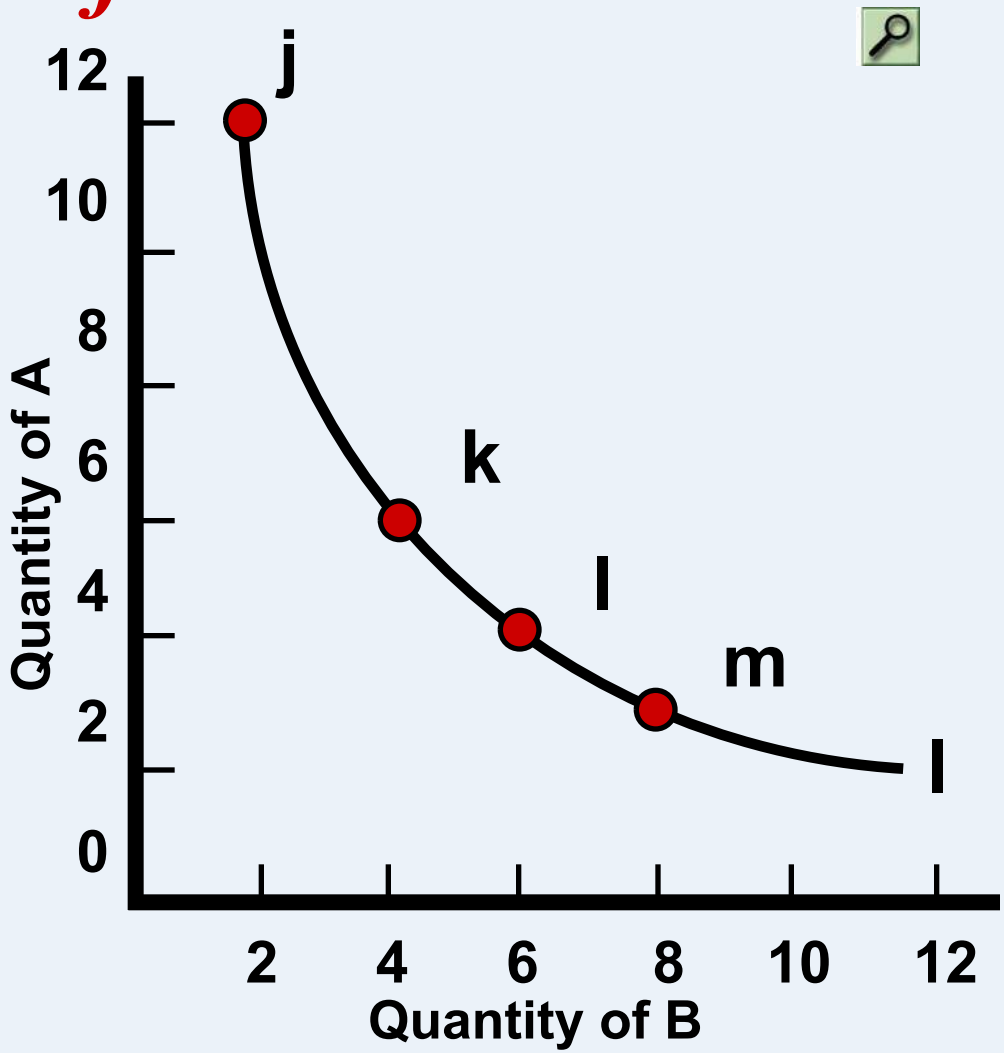

INDIFFERENCE CURVES

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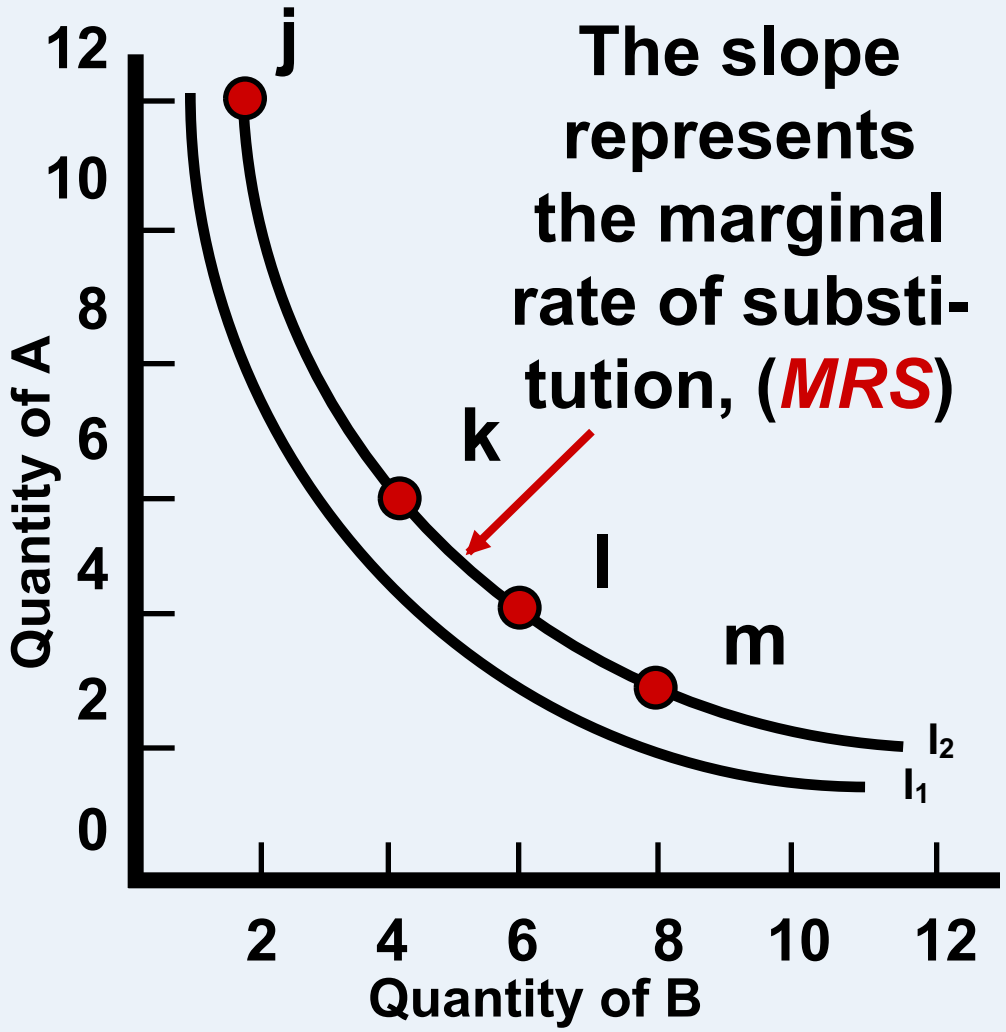


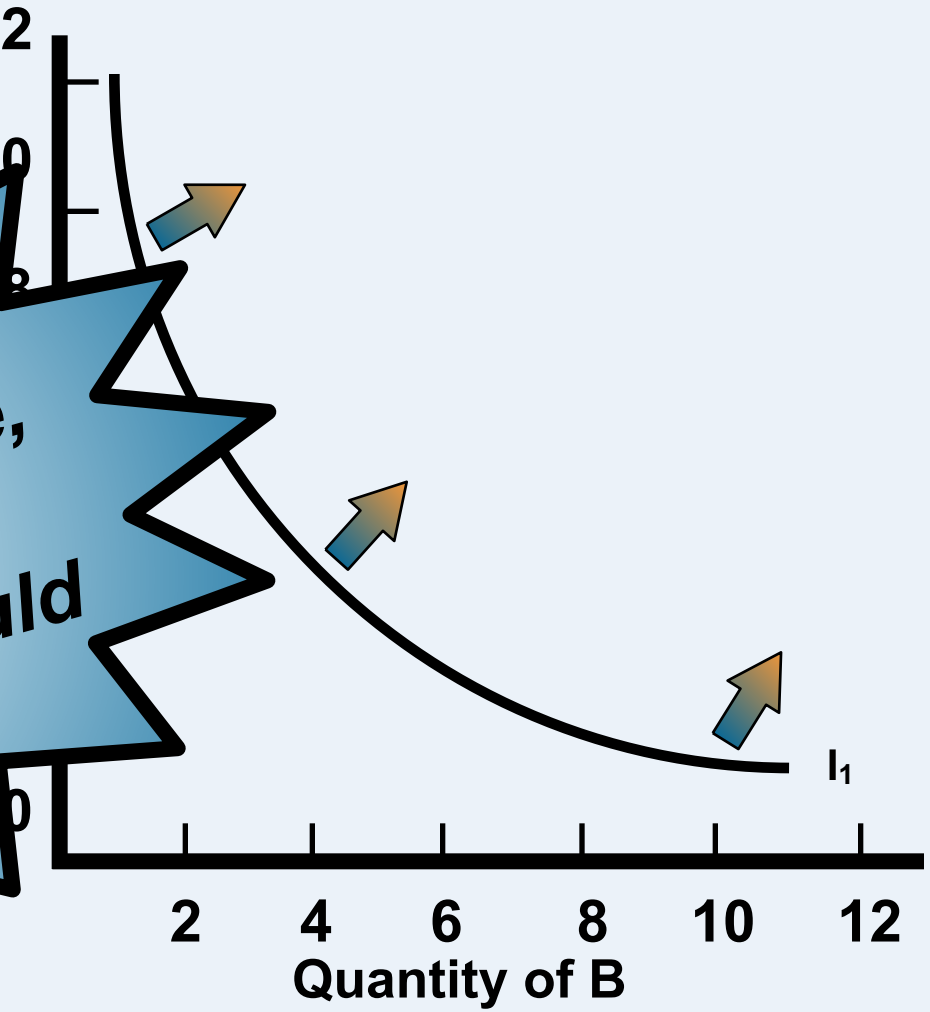
The slope represents the marginal rate of substi-tution, (*MRS*)

INDIFFERENCE CURVES

What is Preferred

Units of A Price $1.50	Units of B Price $1.00	Total Expenditures
8	0	$12
6		
l	4	6
m	3	8

If the consumer had greater income, more of either or both products could be purchased.



INDIFFERENCE CURVES

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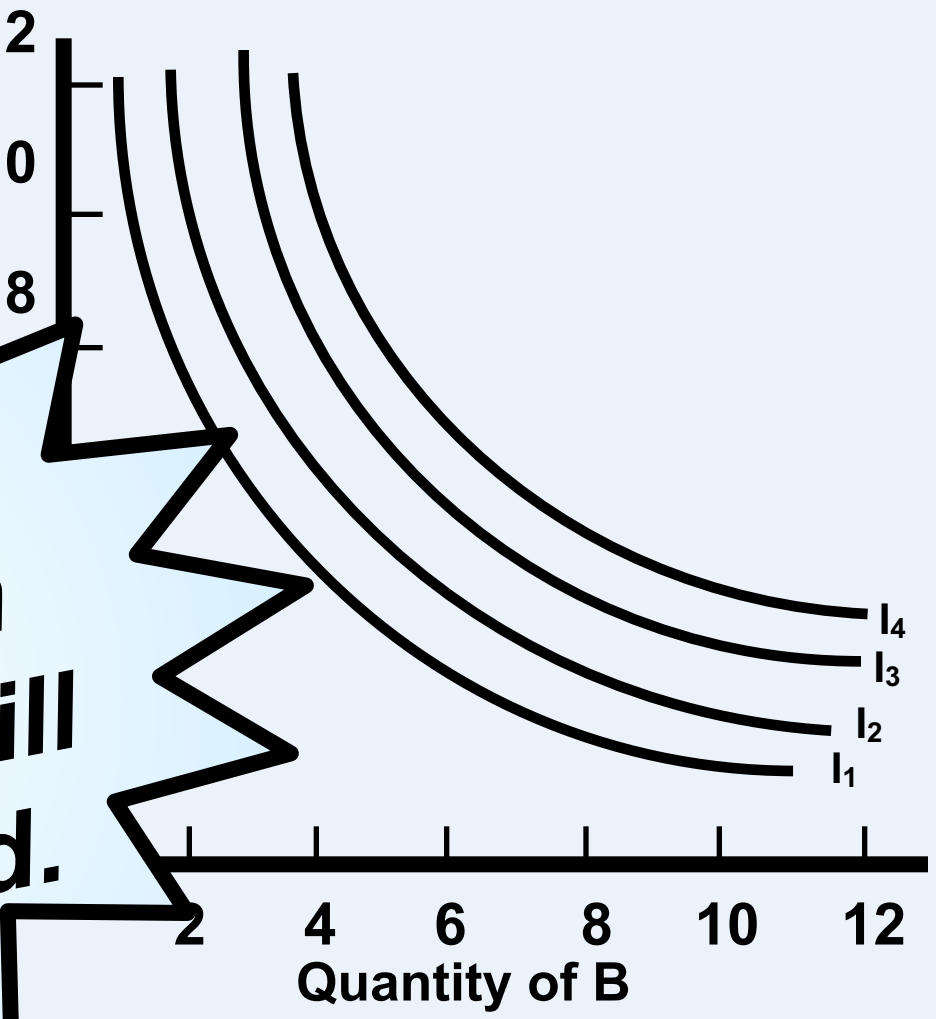


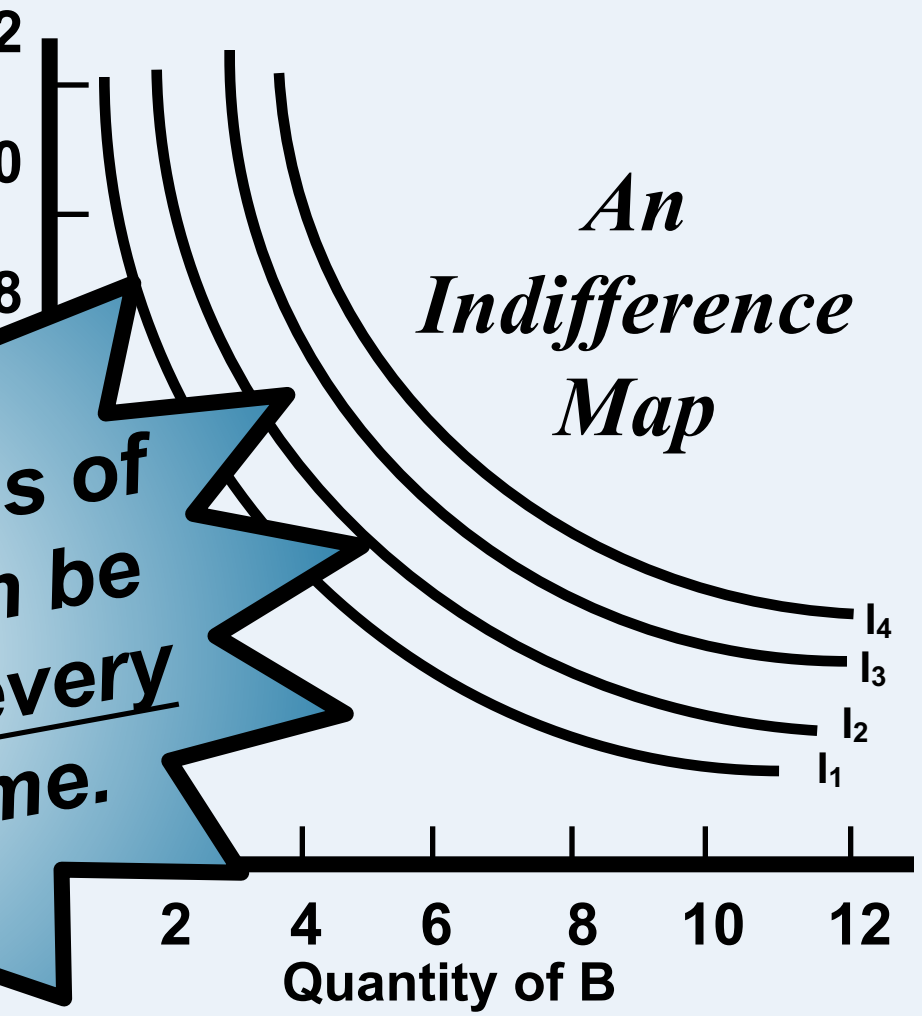
A higher combination of choices will be preferred.

INDIFFERENCE CURVES

What is Preferred

Units of A Price $1.50	Units of B Price $1.00	Total Expenditures
8	0	$12
6	3	12
m	3	8

A family of all such expressions of indifference can be developed for every level of income.



The Slopes of Indifference Curves and Budget Lines

- Tangency Conditions
  - Utility maximization point on the budget line tangent to an indifference curve
  - Marginal rate of substitution = price ratio at that point

EQUILIBRIUM AT TANGENCY

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An Indifference Schedule

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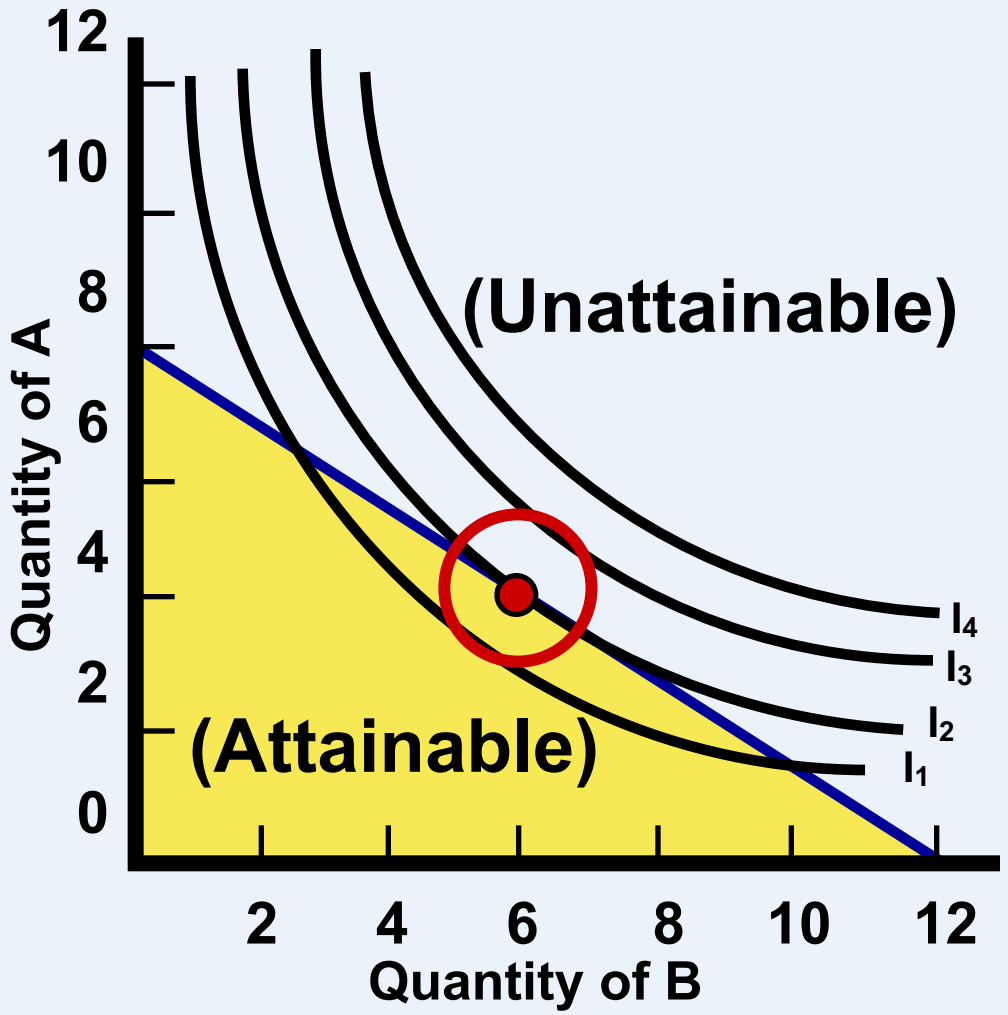
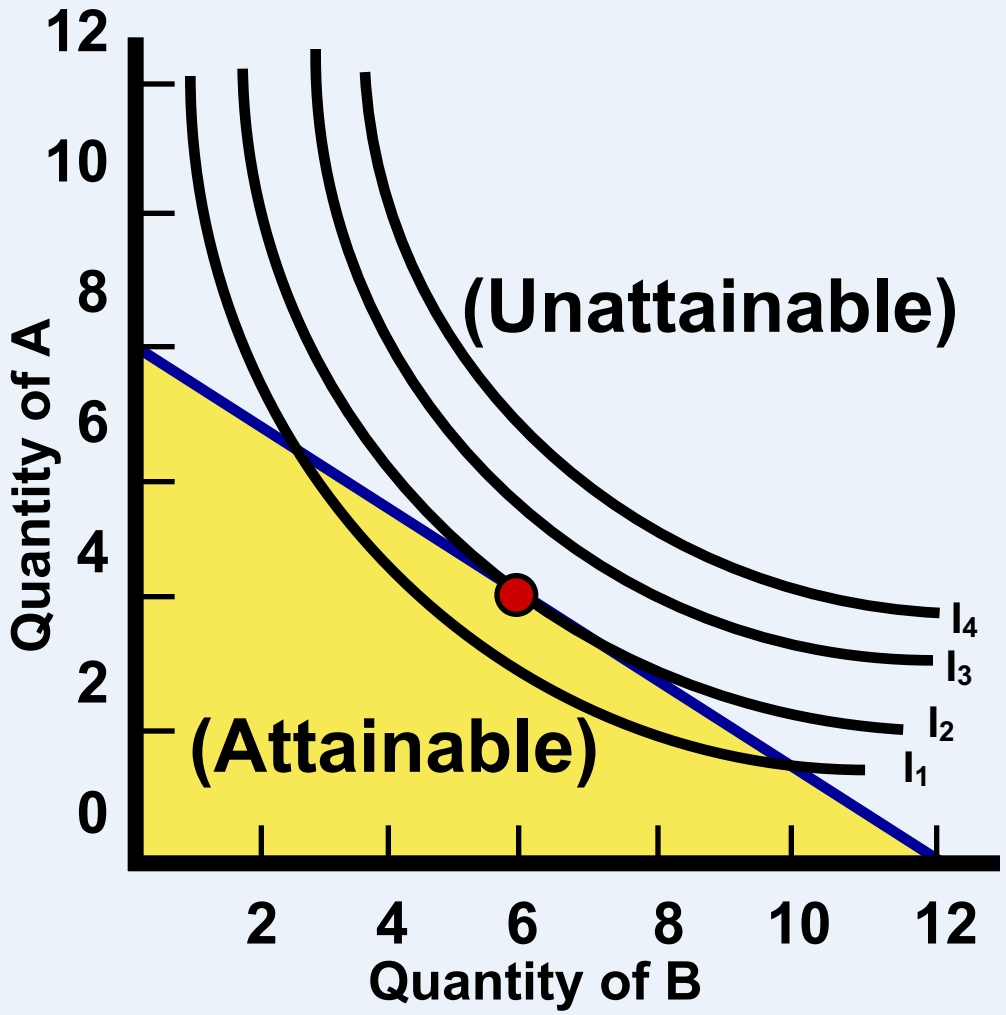


EQUILIBRIUM AT TANGENCY

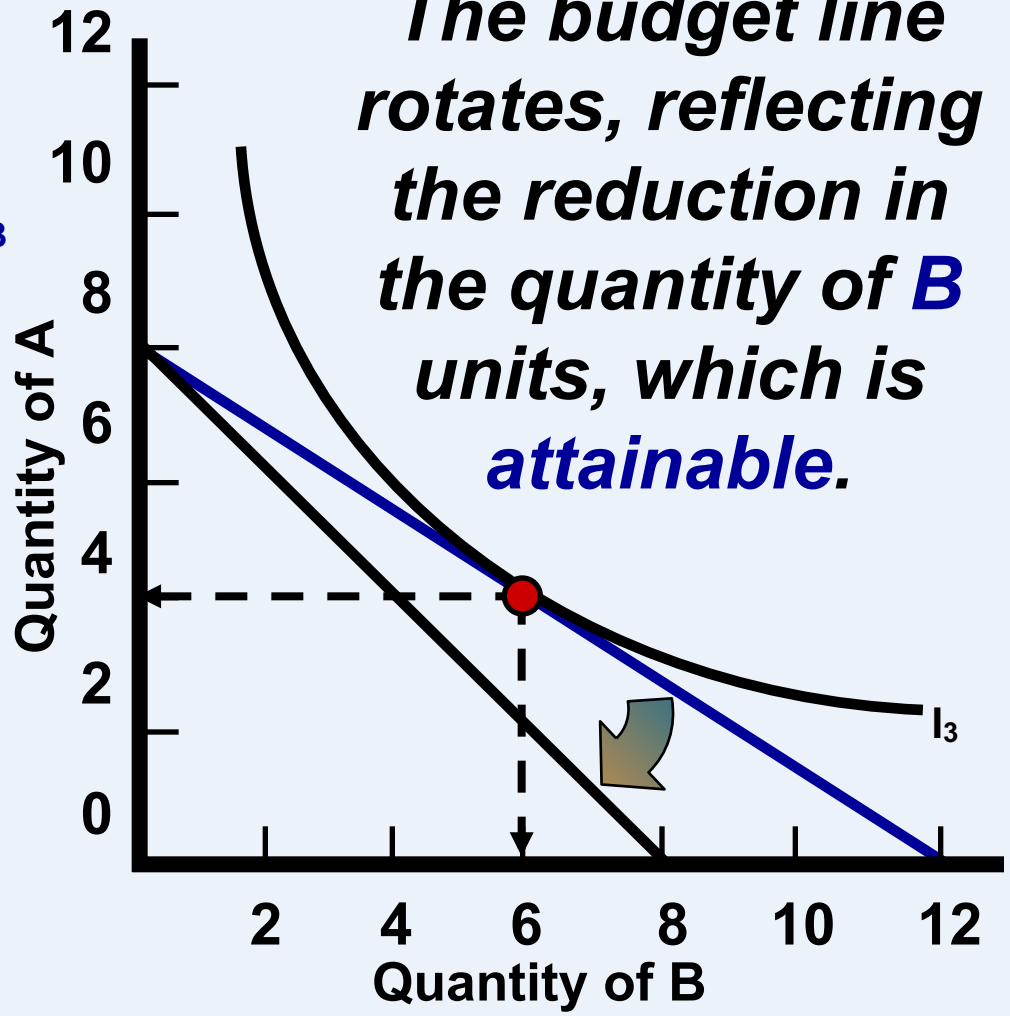
Equilibrium occurs when the consumer selects the combination which reaches the highest attainable indifference curve.



EQUILIBRIUM AT TANGENCY

What happens if the price of B increases to $1.50

$Price_B$	$Quantity_B$
$1.00	6

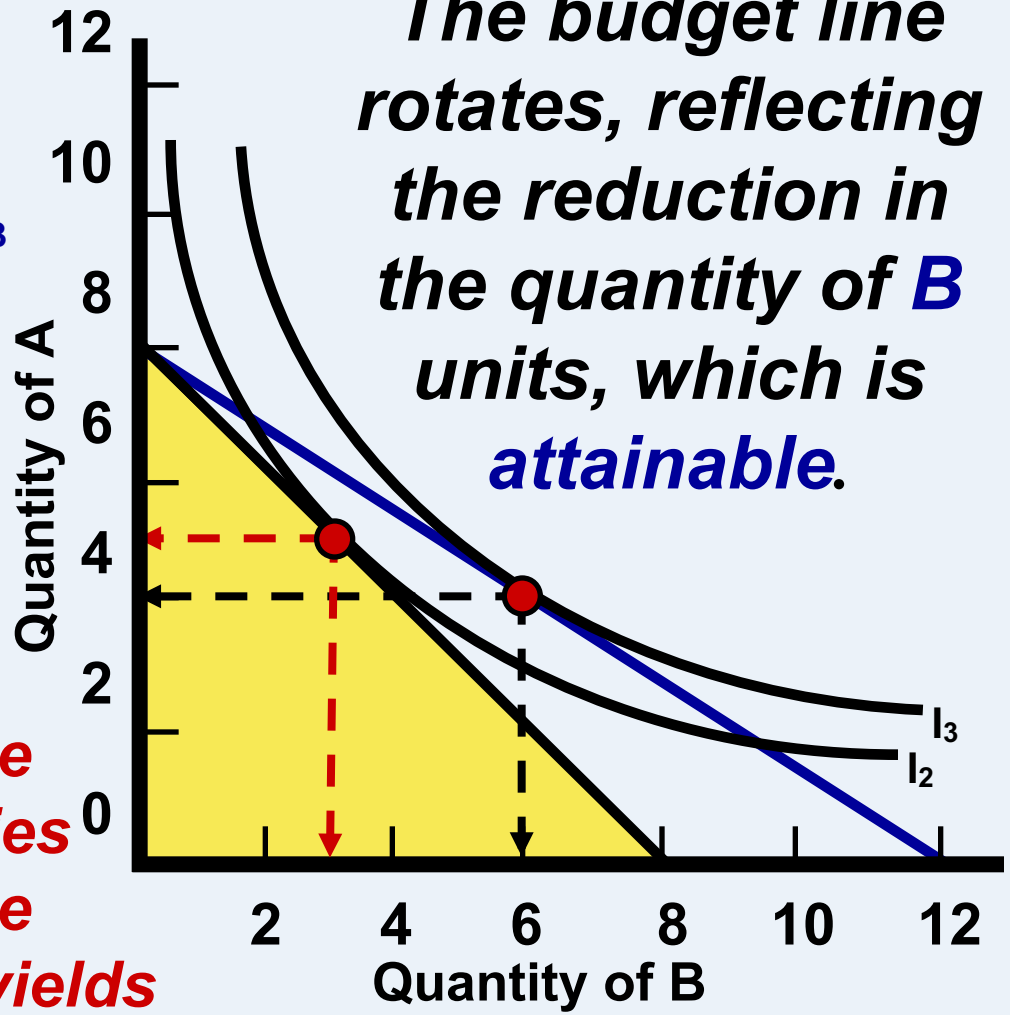


The budget line rotates, reflecting the reduction in the quantity of B units, which is attainable.

EQUILIBRIUM AT TANGENCY

What happens if the price of B increases to $1.50

$Price_B$	$Quantity_B$
$1.00	6
1.50	3



The budget line rotates, reflecting the reduction in the quantity of B units, which is attainable.

By recording the various quantities demanded at the various prices yields the Demand schedule

The Slopes of Indifference Curves and Budget Lines

- Consequences of Income Changes: Inferior Goods
  - Inferior goods: indifference curves located such that ↑ income ⇒
    - ↑ purchases of one good
    - ↓ purchases of the other

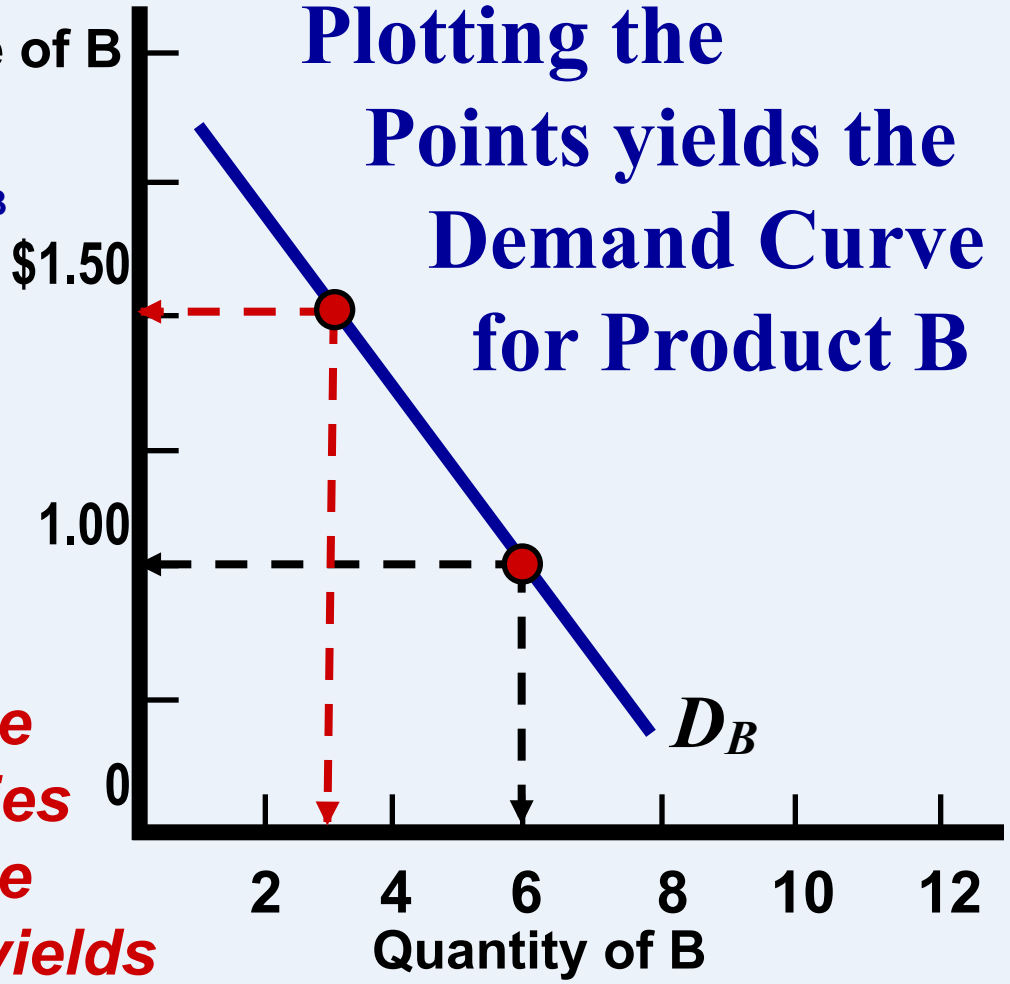
The Slopes of Indifference Curves and Budget Lines

- Consequences of Price Changes: Deriving the Demand Curve
  - Δ slope of the budget line
  - $\uparrow$ quantity purchased of that good
  - Δ quantity of the other good

DERIVING THE DEMAND CURVE

What happens if the price of B increases to $1.50

$Price_B$	$Quantity_B$
$1.00	6
1.50	3



Plotting the Points yields the Demand Curve for Product B

By recording the various quantities demanded at the various prices yields the Demand schedule

Key Terms

budget line
indifference curve
marginal rate of substitution (MRS)
indifference map
equilibrium position