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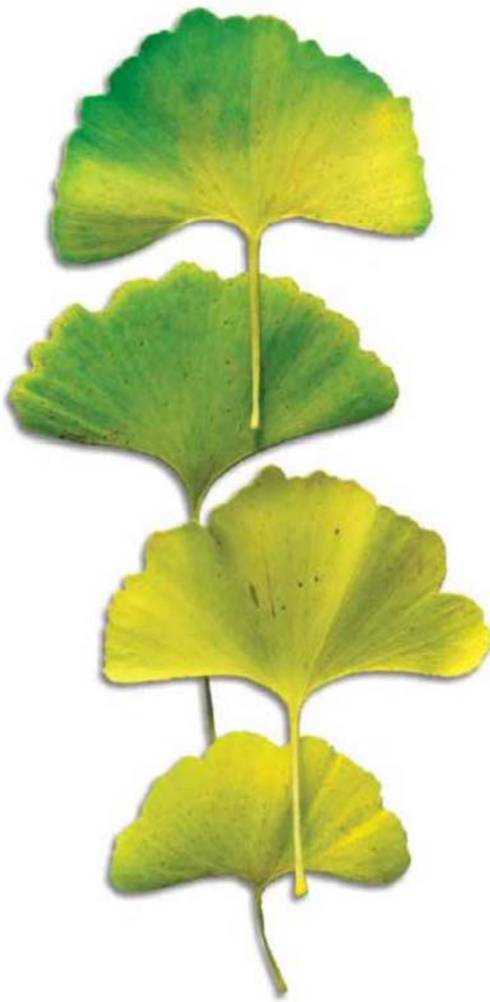

Chapter 3

Rational Consumer Choice

Chapter Outline

- The Opportunity Set or Budget Constraint
- Budget Shifts Due to Price or Income Changes

BL

- Consumer Preferences

IC

- The Best Feasible Bundle
- Appendix:
  - The Utility Function Approach to the Consumer Choice
  - Cardinal versus Ordinal Utility
  - Generating Indifference Curves Algebraically

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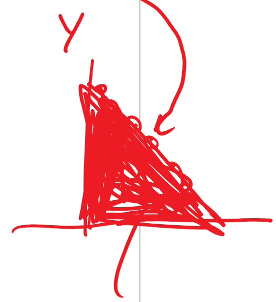
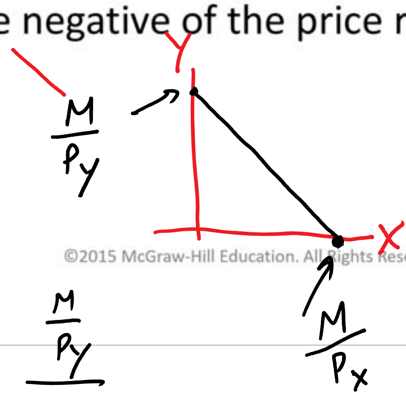
Budget Limitation

- A ***bundle:*** a particular combination of two or more goods.

(BUDGET LINE)

- ***Budget constraint:*** the set of all bundles that exactly exhaust the consumer’s income at given prices.
  - Its slope is the negative of the price ratio of the two goods.





→ M baht/wk

→ P_x baht/unit

→ P_y baht/unit

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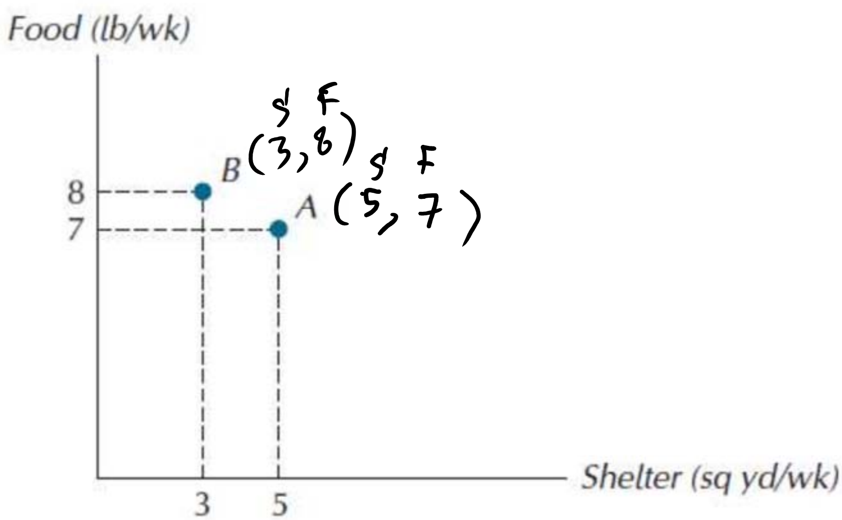
$$\text{slope} = -\frac{\frac{M}{P_y}}{\frac{M}{P_x}}$$

$$= -\frac{\cancel{M}}{P_y} \times \frac{P_x}{\cancel{M}} = \boxed{-\frac{P_x}{P_y}}$$

Figure 3.1: Two Bundles of Goods



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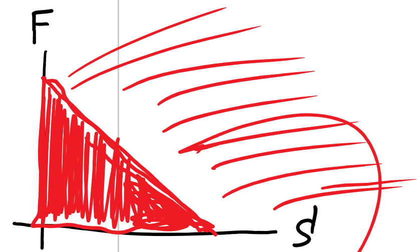
Affordable vs. Unaffordable

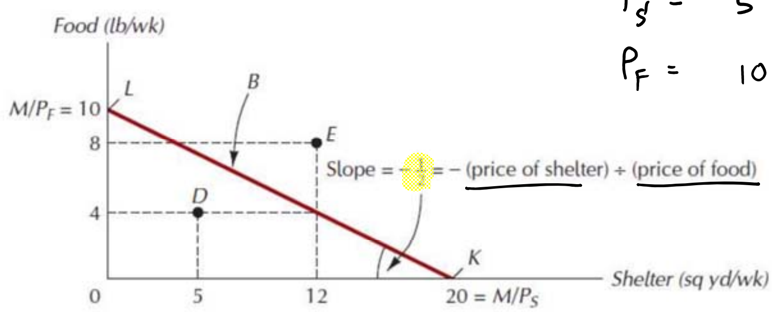
- **Affordable set**, or feasible set: bundles on or below the budget constraint; bundles for which the required expenditure at given prices is less than or equal to the income available.



- **Unaffordable set**, or unfeasible set: bundles that lie outside the budget constraint

Figure 3.2: The Budget Constraint, or Budget Line

$M = 100$ \$/wk
$P_S = 5$ \$/sq yd
$P_F = 10$ \$/lb



$\left(= -\frac{P_S}{P_F}\right)$

slope of BL ⇒ opportunity cost of having an extra square yard of shelter measured in term of how many unit of Food he must give up. (here $= -\frac{1}{2}$ lb/wk forgone)

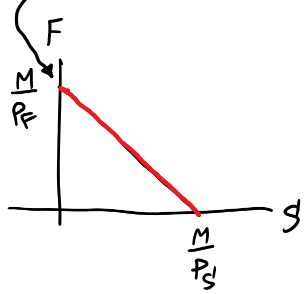
BL Equation

① we know that on the BL, expenditure = income.

② $P_S \cdot S + P_F \cdot F = M$

$P_F \cdot F = M - P_S \cdot S$

$F = \frac{M - P_S \cdot S}{P_F}$



$\boxed{F = \frac{M}{P_F} - \frac{P_S}{P_F} \cdot S}$ BUDGET LINE EQUATION

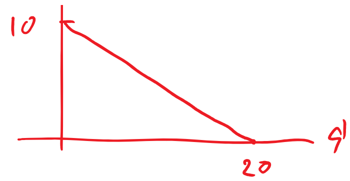
INTERCEPT Y-AXIS

slope of the BL

Ex: $F = \frac{100}{10} - \frac{5}{10} \cdot S = 10 - \frac{1}{2} S$ or

$\boxed{F = 10 - 0.5 S}$

10	0
10−0.5=9.5	1



$$\begin{array}{llll}
10 & & 0 & \\
10-0.5=9.5 & & 1 & \\
 & -0.5 & & +1 \\
10-0.5\cdot 2=9 & & 2 & \\
 & -0.5 & & +1 \\
10-0.5\cdot 3=8.5 & & 3 & \\
\vdots & & \vdots &
\end{array}$$

Budget Shifts Due to Price and Income Changes

- If the price of ONLY one good changes…
  - The slope of the budget constraint changes.
- If the price of both goods change by the same proportion…
  - The budget constraint shifts parallel to the original one.
- If income changes ….
  - The budget constraint shifts parallel to the original one.

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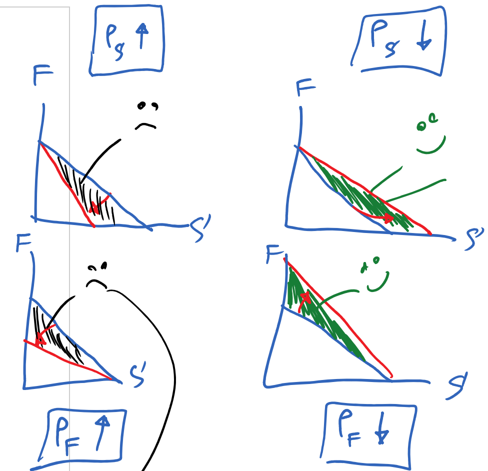

new affordable choices

no longer afforable bundles

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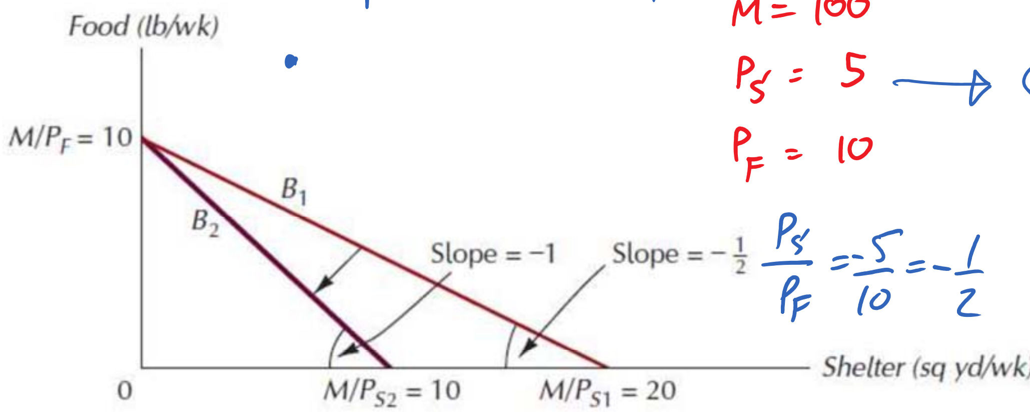
Figure 3.3: The Effect of a Rise in the Price of Shelter

- slope become steeper
-



B/F	A/F
$M = 100$	$M = 100$
$P_S = 5 \longrightarrow$	$P_S' = 10$
$P_F = 10$	$P_F = 10$
$\frac{P_S}{P_F} = -\frac{5}{10} = -\frac{1}{2}$	$\frac{P_S'}{P_F} = -\frac{10}{10} = -1$

$P_S \uparrow$

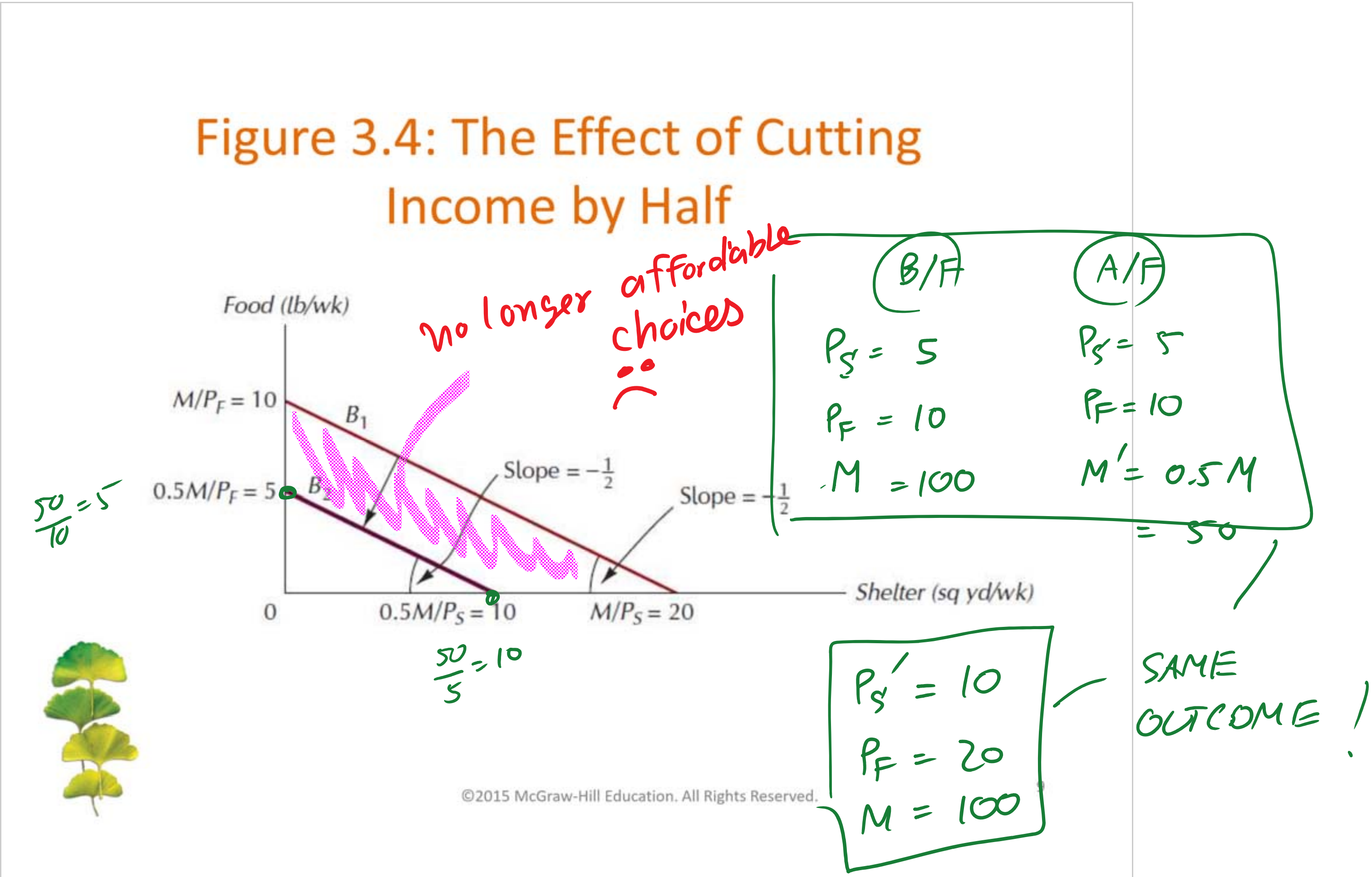


Figure 3.4: The Effect of Cutting Income by Half
Food (lb/wk)
$M/P_F = 10$
B_1
$0.5M/P_F = 5$
B_2
Slope $= -\frac{1}{2}$
Slope $= -\frac{1}{2}$
Shelter (sq yd/wk)
0
$0.5M/P_S = 10$
$M/P_S = 20$
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no longer affordable choices
$\frac{50}{10} = 5$
$\frac{50}{5} = 10$
B/F
A/F
$P_S = 5$
$P_F = 10$
$M = 100$
$P_S = 5$
$P_F = 10$
$M' = 0.5M = 50$
$P_S' = 10$
$P_F = 20$
$M = 100$
SAME OUTCOME!

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Budgets Involving More Than Two Goods

- When we have more than 3 goods, the budget constraint becomes a **hyperplane**, or **multidimensional plane**.
- In this case, view the consumer's choice as one between a good, *X*, and an amalgam of other goods, *Y*. This amalgam is called the **composite good**.
  - The amount of income left after buying good *X*
  - The amount the consumer spends on goods other than good *X*

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Figure 3.5: The Budget Constraints with the Composite Good

Composite Good = all other goods except good X

Suppose price of composite good = 1 \$/unit (By convention)

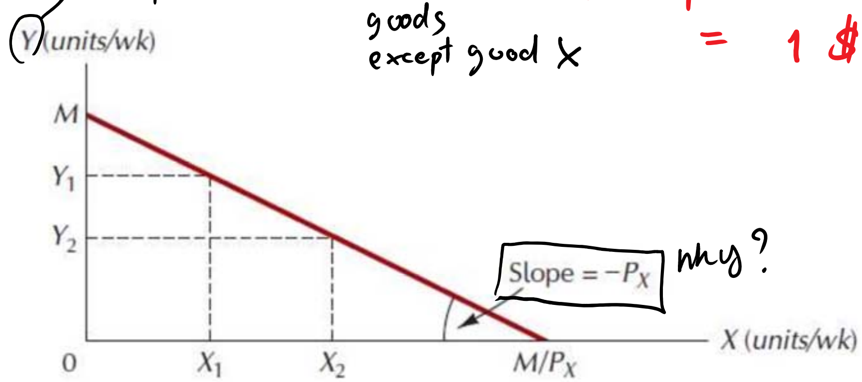

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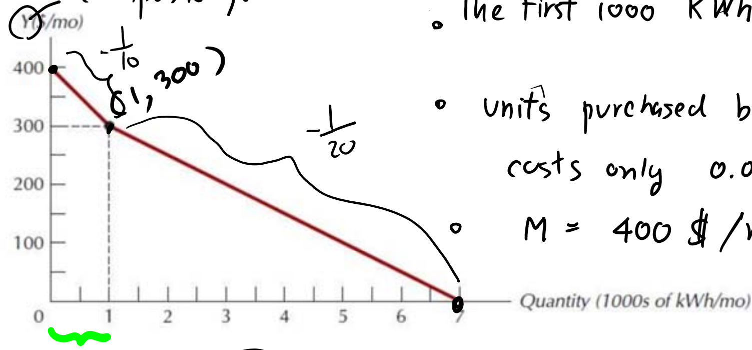
Figure 3.6: A Quantity Discount Gives Rise to a Nonlinear Budget Constraint

composite good



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- The first 1000 KWh of power costs him 0.10 $/KWh
- units purchased beyond the first 1000 kWh costs only 0.05 $/KWh
- M = 400 $/month

1020 kWh
1000 → 1020 → +20 kwh → costs 1$/month

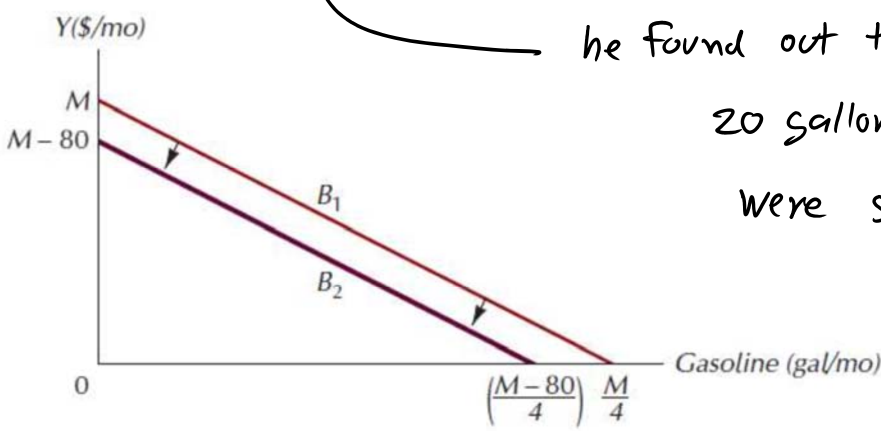
980 kwh/m → 1000/m
+20 kwh → costs 2$/month

Figure 3.7: Budget Constraints Following Theft of Gasoline, Loss of Cash

80 $ loss

he found out that

20 gallons of his oil tank were stolen (80$ loss)



Preference Ordering

- **Preference ordering**: a ranking of all possible consumption bundles in order of preference.
  - Differ widely among consumers
  - Four simple properties of preference ordering

Properties of Preference Orderings

- ***Completeness:*** the consumer is able to rank all possible combinations of goods and services.
- ***More-Is-Better:*** other things equal, more of a good is preferred to less.
- ***Transitivity:*** for any three bundles A, B, and C, if he prefers A to B and prefers B to C, then he always prefers A to C.
- ***Convexity:*** mixtures of goods are preferable to extremes.

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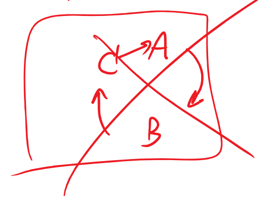
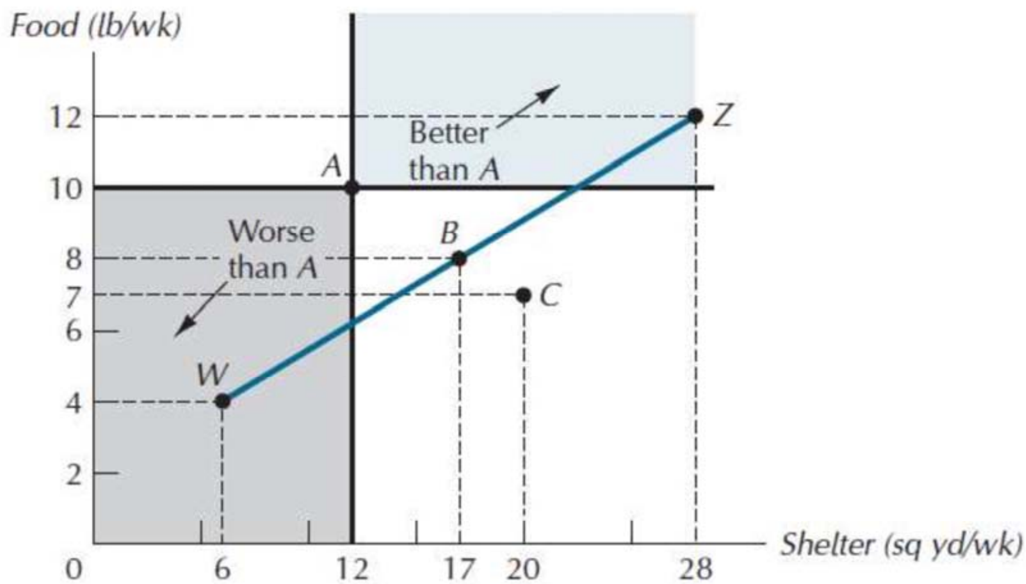
$\succ$ = is prefered

If $A \succ B$ and $B \succ C'$, then $A \succ C$



$\boxed{A \to B \to C'}$

Figure 3.8: Generating Equally Preferred Bundles



Indifference Curves

- ***Indifference curve:*** a set of bundles among which the consumer is indifferent.

- ***Indifference map:*** a representative sample of the set of a consumer's indifference curves, used as a graphical summary of her preference ordering.

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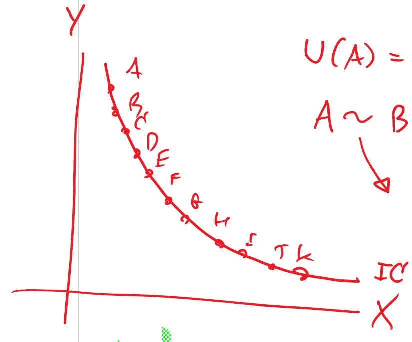
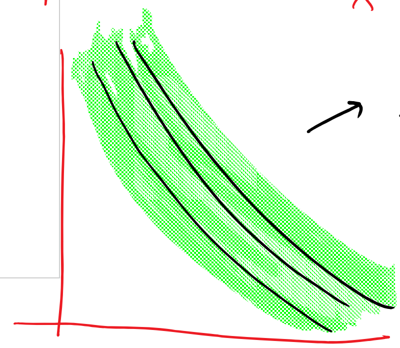


$U(A) = U(B) = U(C) = \ldots$

$A \sim B \sim C \sim D \sim E \ldots$

indifferent

$\sim$



INDIFFERENCE MAP

Properties of Indifference Curves

- Indifference curves …

1. Are Ubiquitous.
   - Any bundle has an indifference curve passing through it.
2. Are Downward-sloping.
   - This comes from the "more-is-better" assumption.
3. Cannot cross.
4. Become less steep as we move downward and to the right along them.
   - This property is implied by the convexity property of preferences.

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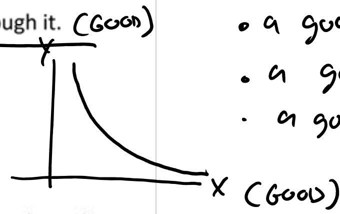

- a good is good if more is better applied.
- a good is bad if less is prefered to more.
- a good is neuter if having more or having less do not affect your utility.

Figure 3.9: An Indifference Curve

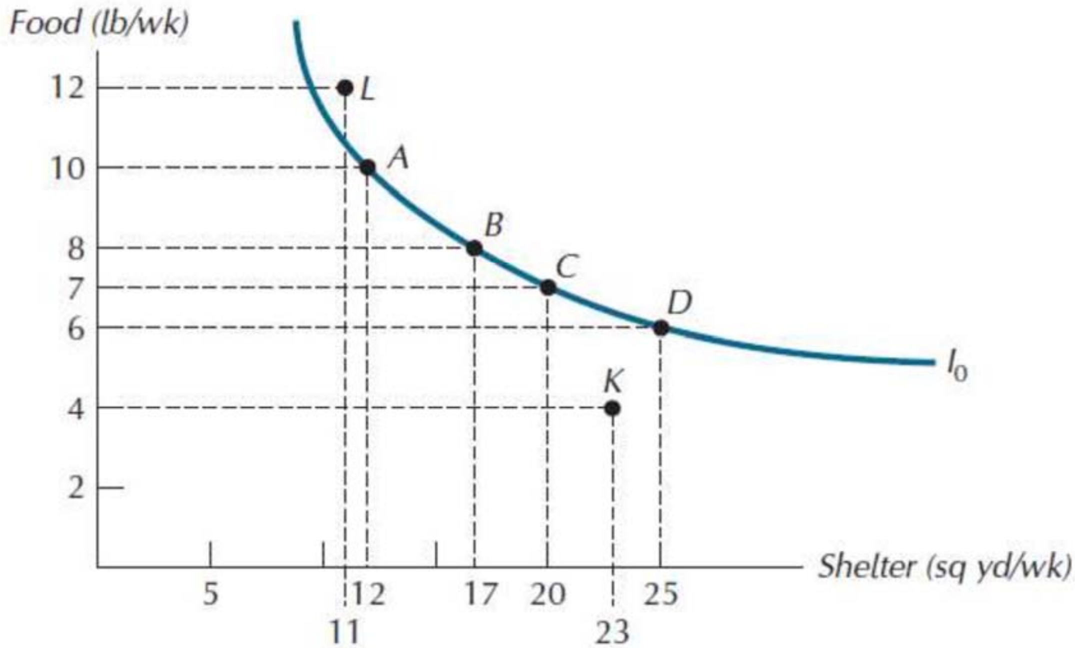

Figure 3.10: Part of an Indifference Map

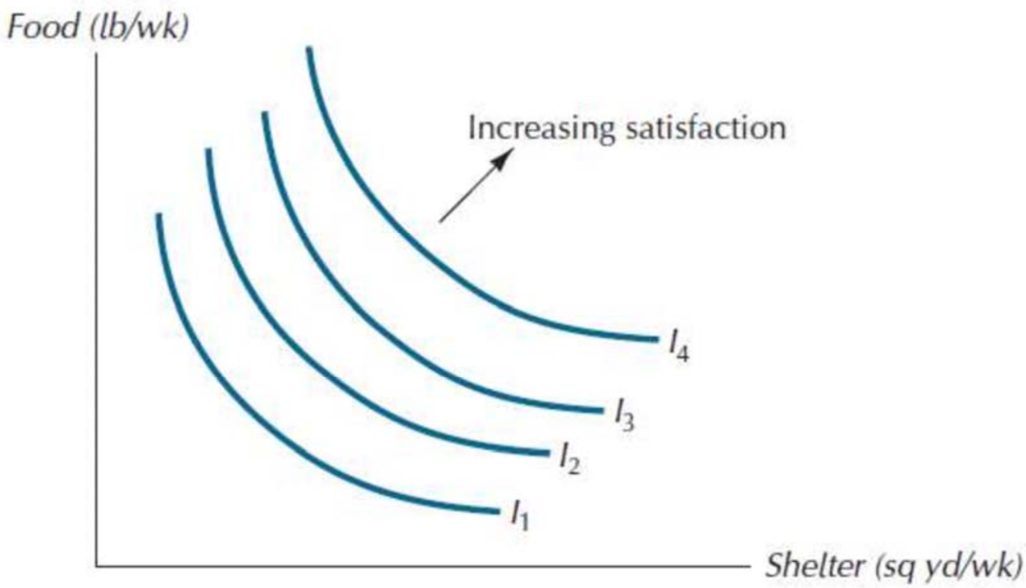

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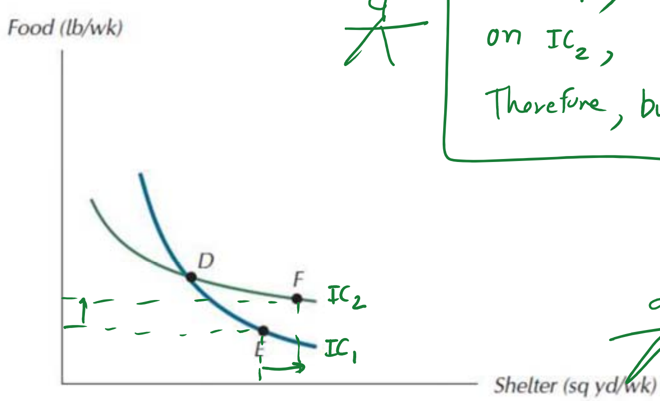
Figure 3.11: Why Two Indifference Curves Do Not Cross



on IC_1, $D \sim E$
on IC_2, $D \sim F$
Therefore, by transitivity, $D \sim E$ and $D \sim F$, so $E \sim F$.

Since F has more of the two goods compared to E, so, by more is better, $\boxed{F \succ E}$

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Since the two statements cannot be true at the same time, then crossing ICs generates this contradiction.

To avoid such contradiction, do not allow IC's to be crossed!

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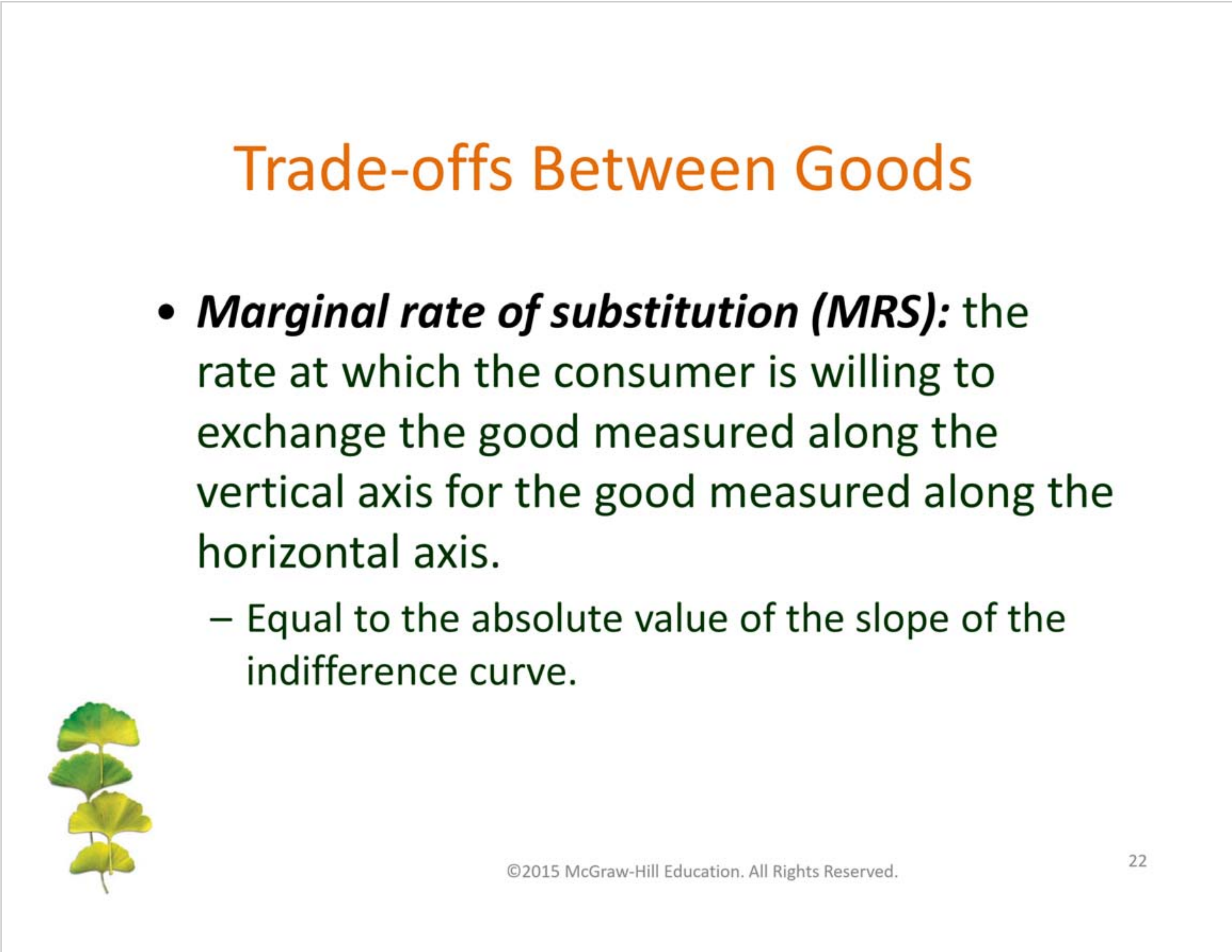

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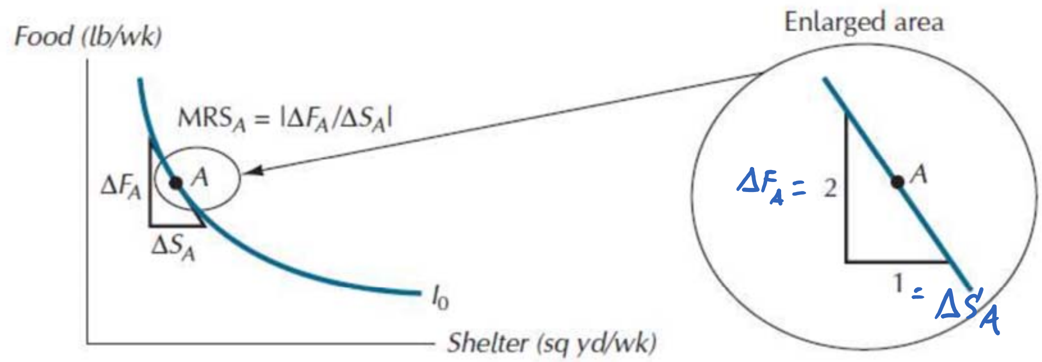
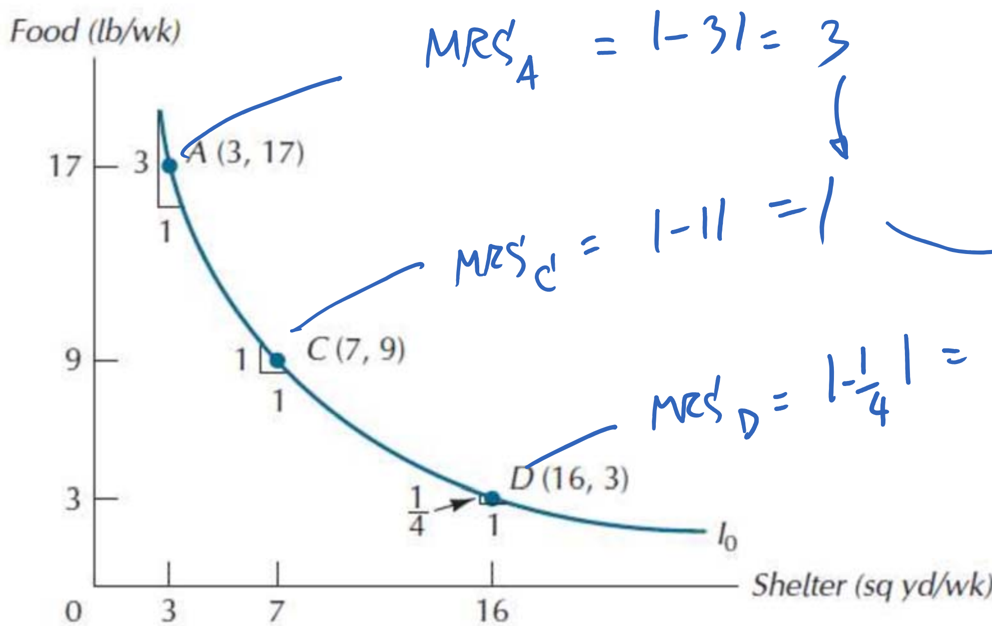
Figure 3.12: The Marginal Rates of Substitution



$MRS'_A = |-2| = 2$

Figure 3.13: Diminishing Marginal Rate of Substitution

(Why?)



$MRS_A = |-3| = 3$

$MRS_C = |-1| = 1$

$MRS_D = |-\frac{1}{4}| = \frac{1}{4}$ or 0.25

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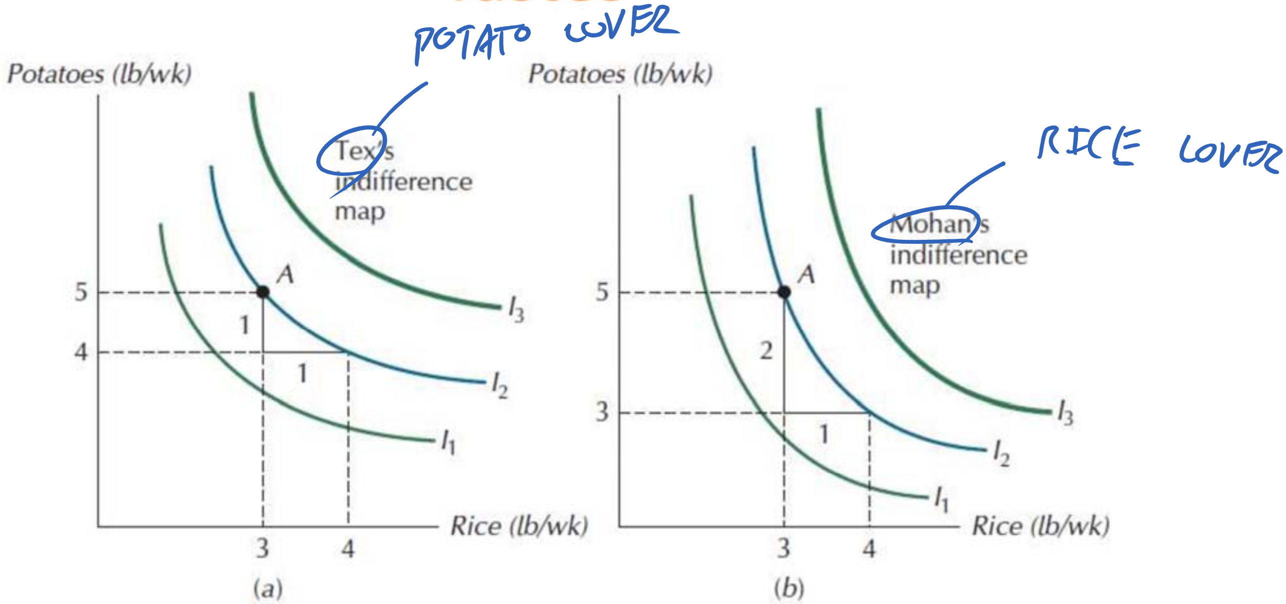
Figure 3.14: People with Different Tastes



The Best Feasible Bundle

- Consumer's Goal: to choose the **best affordable bundle.**
  - The same as reaching the highest indifference curve she can, given her budget constraint.
  - For convex indifference curves..
    - the best bundle will always lie at the point of tangency.

MAX UTILITY $\Rightarrow$ MAX $U(S,F)$

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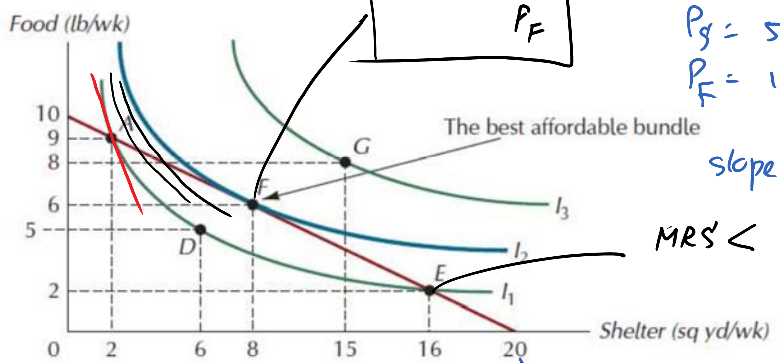
Figure 3.15: The Best Affordable Bundle



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$\boxed{MRS = \frac{P_S}{P_F}}$ → $\boxed{\frac{MU_S}{MU_F} = \frac{P_S}{P_F}}$ → $\boxed{\frac{MU_S}{P_S} = \frac{MU_F}{P_F}}$

Tangency condition

$M = 100$ \$/wk

$P_S = 5$ \$/sq yd

$P_F = 10$ \$/lb

slope of BL $= -\frac{P_S}{P_F} = -\frac{5}{10} = -\frac{1}{2} = -0.5$

opp. cost of having an extra sq yd of shelter measured in terms of foods

Or, you can view this number as Marginal cost of Shelter (MC_S)

$MRS < \frac{P_x}{P_y}$

$= \frac{M}{P_S} = \frac{100}{5} = 20$

At A: |slope of IC| > |slope of BL|

$$MRS_{SF} > \frac{P_S}{P_F}$$

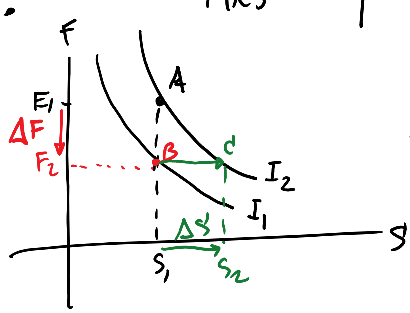
$$\frac{MU_S}{MU_F} > \frac{P_S}{P_F}$$

$$\frac{MU_S}{P_S} > \frac{MU_F}{P_F}$$ happened at A!!!

$\frac{MU_S}{P_S}$: marginal utility PER DOLLAR spent on Shelter

$\frac{MU_F}{P_F}$: marginal utility PER DOLLAR spent on food.

Proof: $MRS = \left| -\frac{MU_S}{MU_F} \right|$



MOVEMENT FROM A→B:

☹ utility loss $= \Delta F \cdot MU_F$ $-10 \cdot 2 = -20$ utils

MOVEMENT FROM B→C:

☺ utility gain $= \Delta S \cdot MU_S$ 5 4 $= +20$ utils

$A \to B \to C \;=\; A \to C$

Utility loss + utility gain = 0 $(\Delta U = 0)$

$$\Delta F \cdot MU_F + \Delta S \cdot MU_S = 0$$

$$\Delta F \cdot MU_F = -\Delta S \cdot MU_S$$

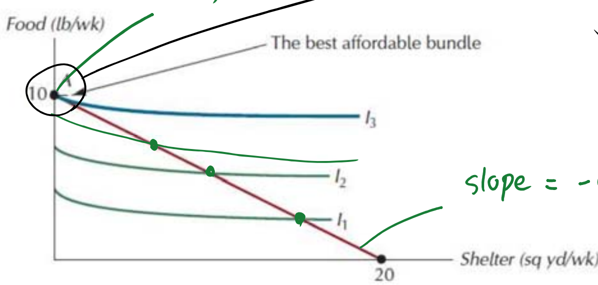
$$\underbrace{\frac{\Delta F}{\Delta S} = -\frac{MU_S}{MU_F}}$$

$$MRS = \left|\frac{\Delta F}{\Delta S}\right| = \left|-\frac{MU_S}{MU_F}\right| = \frac{MU_S}{MU_F}$$

Corner Solutions

- ***Corner solution***: in a choice between two goods, a case in which the consumer does not consume one of the goods.

Figure 3.16: A Corner Solution



S F
(0, 10)

At A: slope of IC < slope of BL

$$\boxed{MRS < \frac{P_S}{P_F}}$$

$$-\frac{P_S}{P_F} = -\frac{5}{10} = -\frac{1}{2}$$

slope = -0.5

Ex: $MRS < \frac{P_S}{P_F}$

$0.25 < 0.5$

In his mind, at most he is willing to give up ONLY 0.25 or $\frac{1}{4}$ lb of good to exchange for 1 sq yd of shelter.

If he wants to have 1 extra sq yd of shelter, market rate for that is... he must give up $\frac{1}{2}$ or 0.5 lb of food.

(recall that $P_S = 5$ \$, $P_F = 10$ \$)

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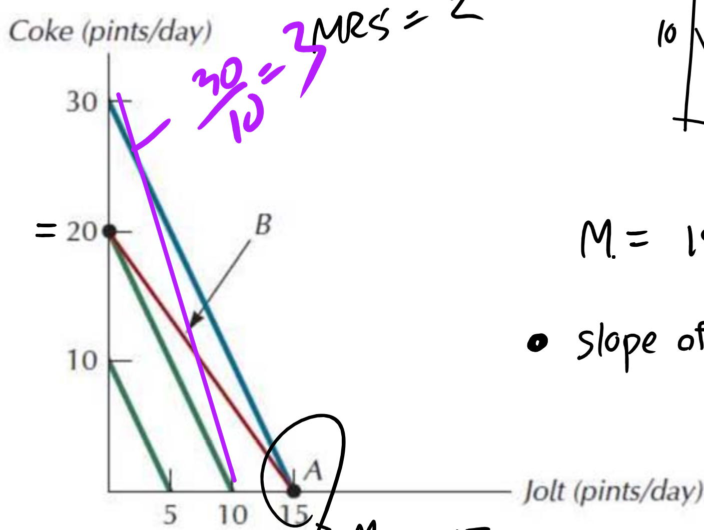
Figure 3.17: Equilibrium with Perfect Substitutes



$\frac{15}{0.75} = \frac{M}{P_C} = 20$

$= \frac{M}{P_J} = \frac{15}{1} = 15$

$MRS = |-1| = 1$

$M = 15$ \$ / wk

- slope of BL $= -\frac{P_J}{P_C} = -\frac{1}{\frac{3}{4}} = -\frac{4}{3}$
- $MRS = 2 > \frac{4}{3}$

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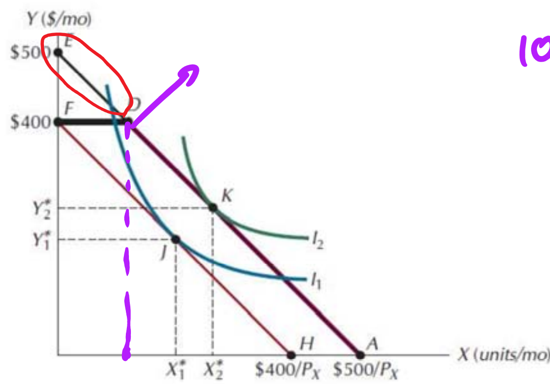
Cash or Food Stamps?

- Food Stamp Program
  - Objective - to alleviate hunger.
  - How does it work?
    - People whose incomes fall below a certain level are eligible to receive a specified quantity of food stamps.
    - Stamps cannot be used to purchase cigarettes, alcohol, and various other items.
    - The government gives food retailers cash for the stamps they accept.

Figure 3.18: Food Stamp Program vs. Cash Grant Program

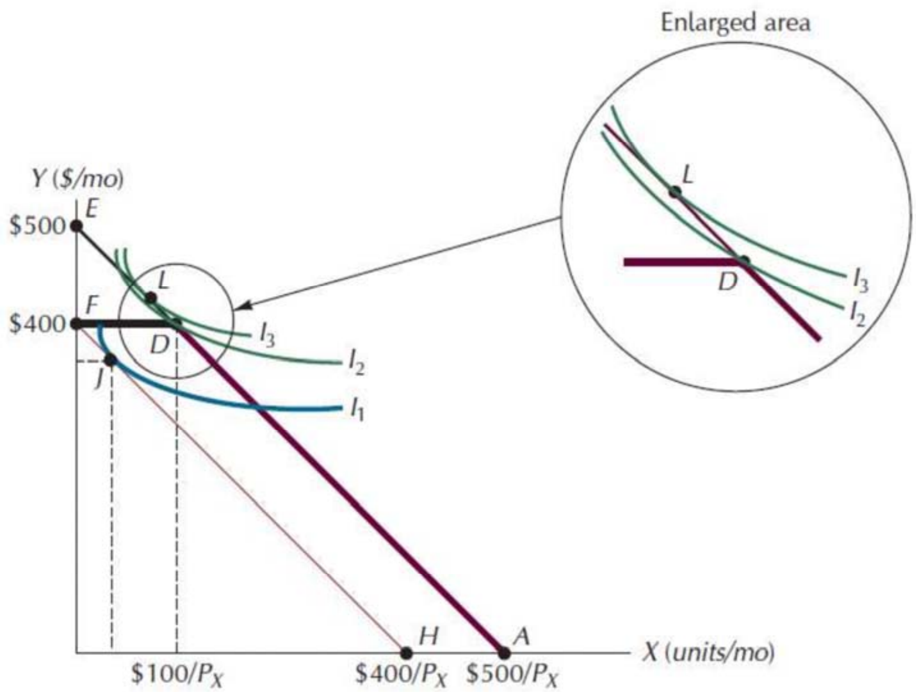


M = 400 $/mo

100 $ as stamps → NEW BC is FDA

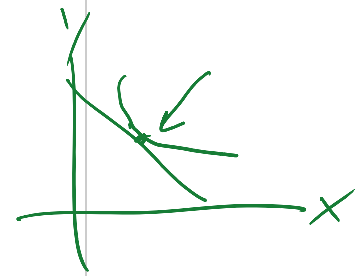
as cash → NEW BC is EA

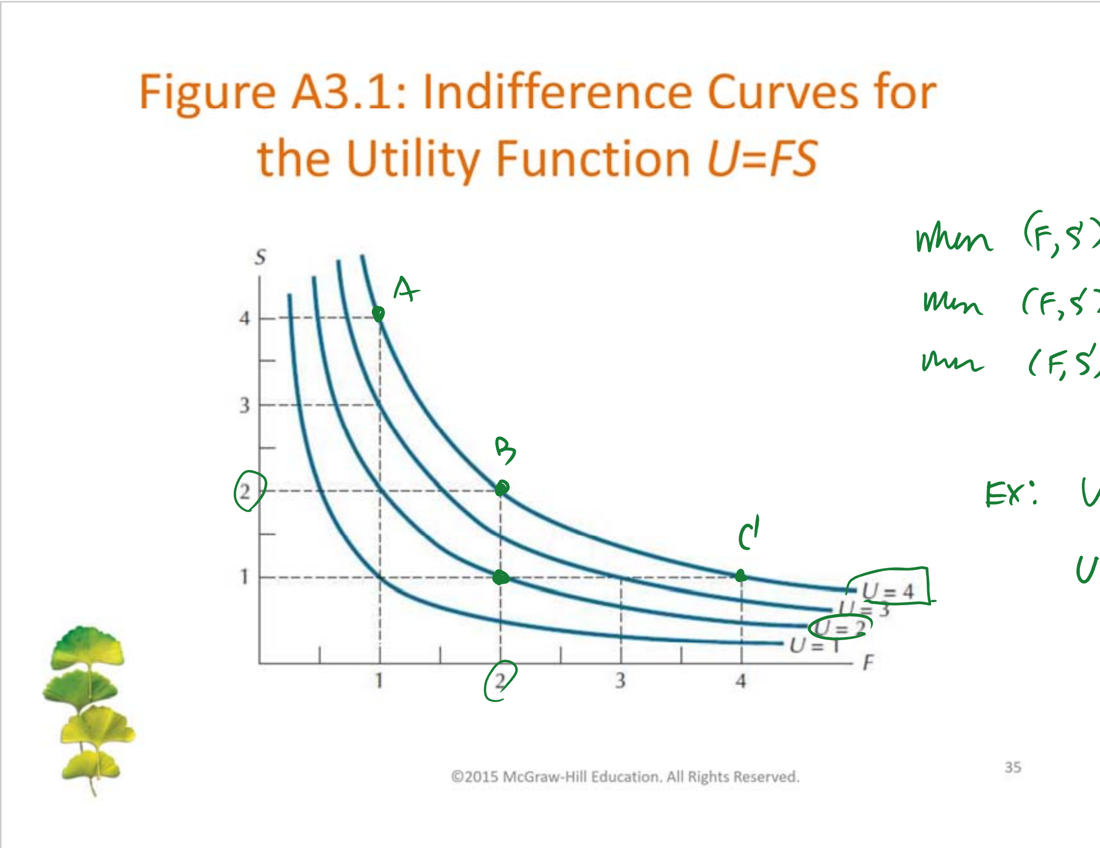
Figure 3.19: Where Food Stamps and Cash Grants Yield Different Outcomes



The Utility Function Approach to Consumer Choice

- Finding the highest attainable indifference curve on a budget constraint is just one way to analyze the consumer choice problem
- In this second approach, we represent the consumer's preference not with an indifference map, but with a *utility function*.





when $(F,S) = (1,4) \rightarrow U = F\cdot S = 4$

when $(F,S) = (2,2) \rightarrow U = F\cdot S = 4$

when $(F,S) = (4,1) \rightarrow U = F\cdot S = 4$

Ex: $U = F^{\frac{1}{2}} S^{\frac{1}{2}}$

$U = F + S$

⋮

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Figure A3.2: Utility Along an Indifference Curve Remains Constant

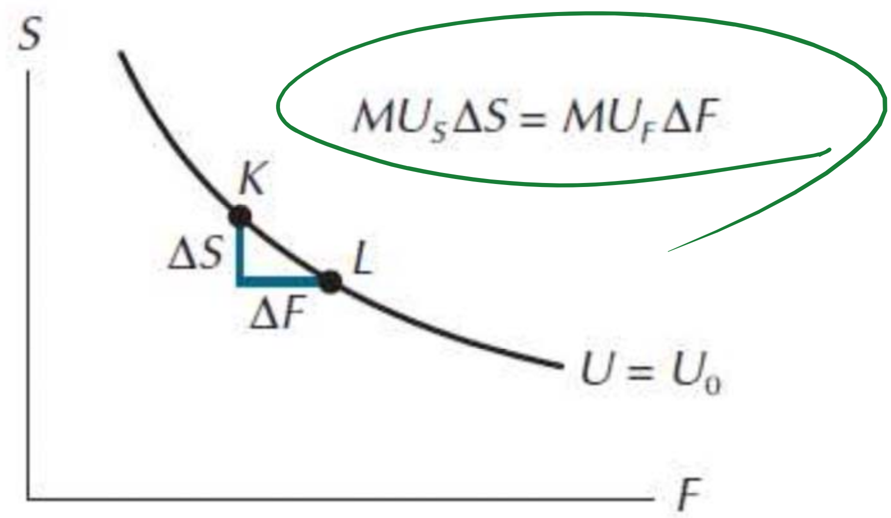

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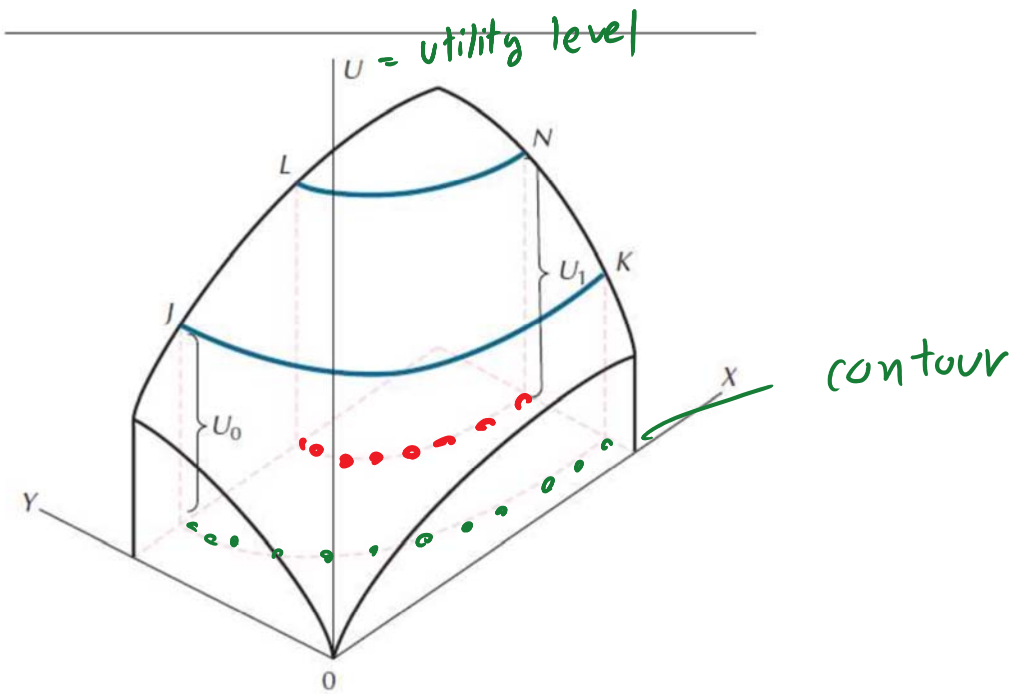
Figure A3.3: A Three-Dimensional Utility Surface



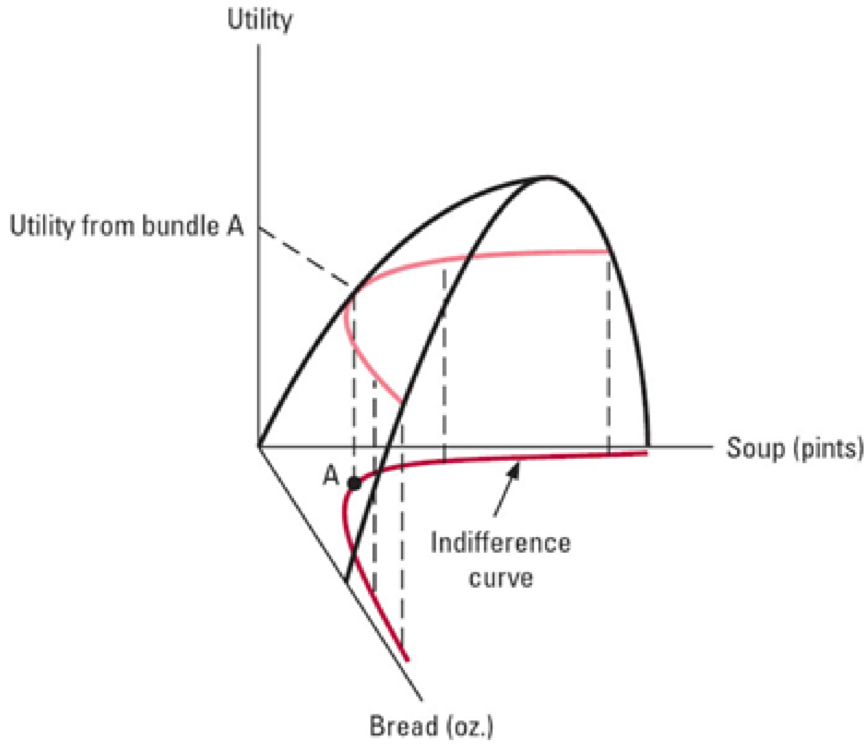

Utility
Utility from bundle A
Soup (pints)
A
Indifference
curve
Bread (oz.)

Figure A3.4: Indifference Curves as Projections

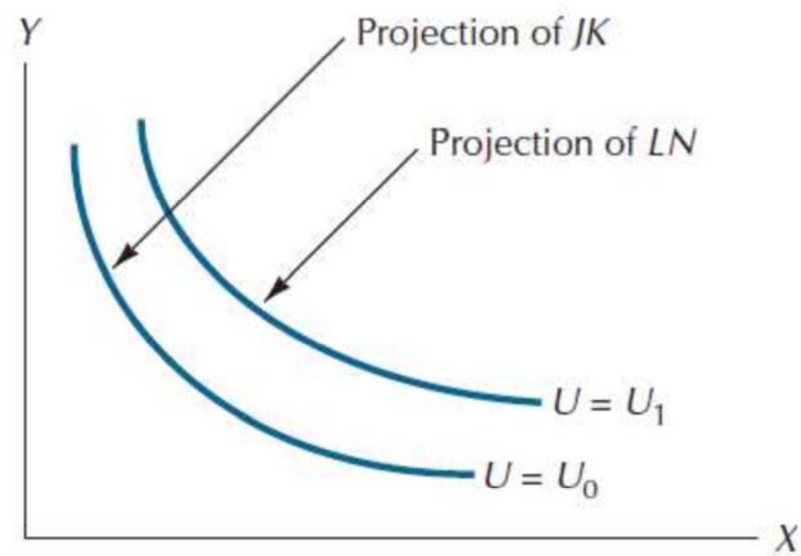


Figure A3.5: Indifference Curves for the Utility Function $U(X,Y)=(2/3)X + 2Y$

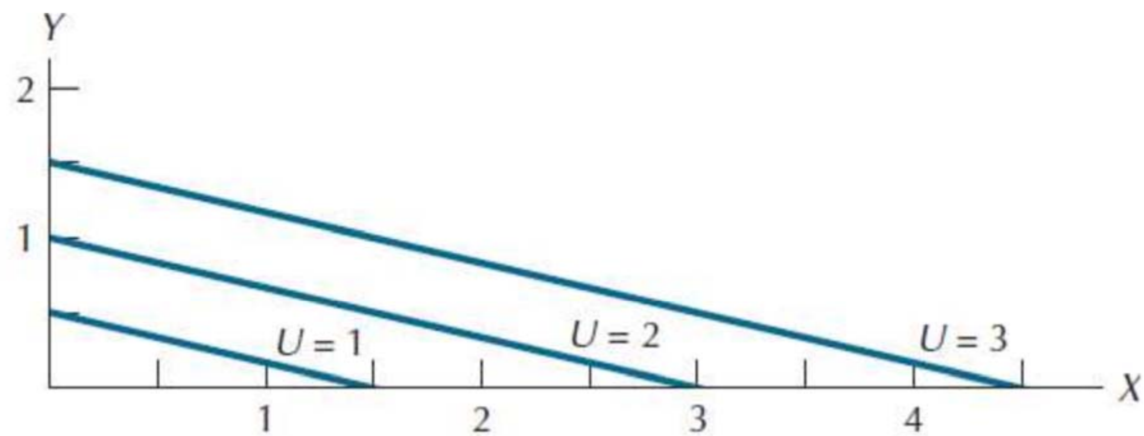


Figure A3.6: The Optimal Bundle when $U=XY$, $P_x=4$, $P_y=2$, and $M=40$