AE 503

EFFICIENCY IN EXCHANGE

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EFFICIENCY IN EXCHANGE

■ **To gain an initial understanding of efficiency, focus on an economy of *pure exchange*. Think of this economy as a desert island with the following characteristics:**

➢ **2 consumers, A and B**

➢ **2 goods, 1 (fruit) and 2 (fish)**

➢ **A's consumption bundle is:**

$$X_A = (x^1_A, x^2_A)$$

B's consumption bundle is:

$$X_B = (x^1_B, x^2_B)$$

➢ **There are fixed amounts of fish and fruit available, each consumer starting off with an *initial endowment*, ω, of each good:**

☞ $\omega^1_A + \omega^1_B = W^1$

☞ $\omega^2_A + \omega^2_B = W^2$

where W^1 and W^2 are total amounts of the two goods available

➢ **The exchange economy is assumed competitive, each consumer taking prices as given**

➢ **Consumers A and B have *well-behaved* preferences**

■ REVIEW

➢ **What are well-behaved preferences?**

➢ **Consumer A's utility function can be written as:**

$$U_A = f(x^1_A, x^2_A)$$

➢ **Essentially, the *utility function* of consumer A, can be represented by the standard *indifference map***

➢ **Efficiency in exchange depends critically on this**

CONSUMPTION BUNDLES

Fish

x^2_A • X''_A (consumption
                bundle 2)

x^2_A X'_A (consumption
                      bundle 1) •

x^1_A x^1_A Fruit
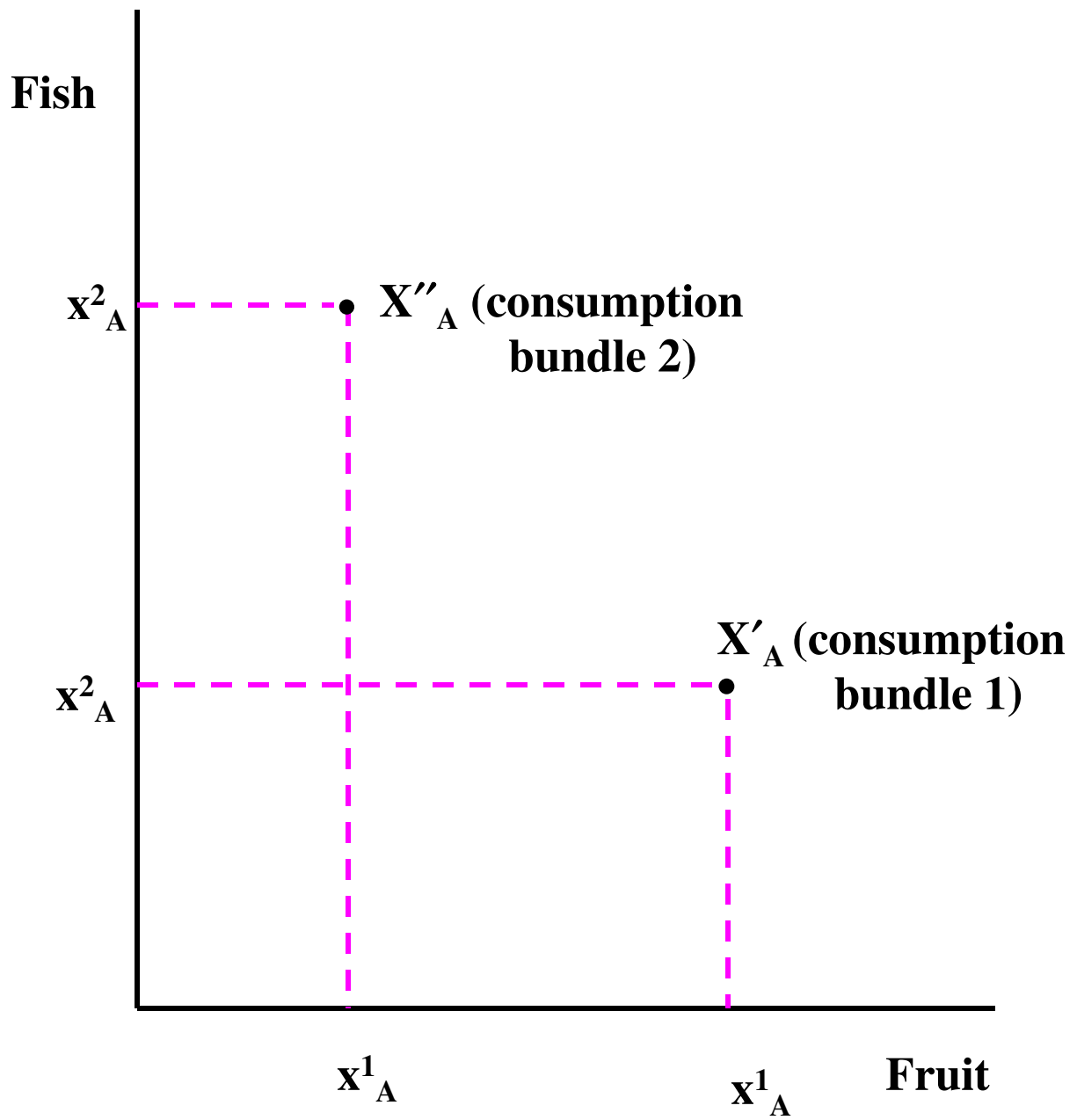
■ **Consumer A has to *rank* consumption bundle 1 (X'_A) with consumption bundle 2 (X''_A)**

➢ **$X'_A > X''_A$** ☞ **consumer A *strictly prefers* bundle 1 to bundle 2**

➢ **$X'_A \sim X''_A$** ☞ **consumer A is *indifferent* between bundles 1 and 2**

➢ **$X'_A \geq X''_A$** ☞ **consumer A *weakly prefers* bundle 1 to bundle 2**

Weak preference means consumer A either prefers bundle 1 over bundle 2 or is indifferent between them

■ **Preferences are assumed to conform to the following axioms:**

➤ *Completeness* ☞ **given two bundles, consumers can make a choice, i.e. $X'_A > X''_A$, or $X'_A \geq X''_A$, or $X'_A \sim X''_A$**

➤ *Reflexivity* ☞ **any bundle is at least as good as itself, i.e. $X'_A \geq X'_A$**

➤ *Transitivity* ☞ **if $X'_A > X''_A$,**

and if $X''_A > X'''_A$,

then $X'_A > X'''_A$

i.e. if consumer A prefers bundle 1 to bundle 2, and prefers bundle 2 to another bundle 3, then consumer A prefers bundle 1 to bundle 3

INDIFFERENCE CURVE

Fish

Weakly Preferred Set

X'_A

x^2_A

X'_A

x^1_A

X''_A

Indifference Curve
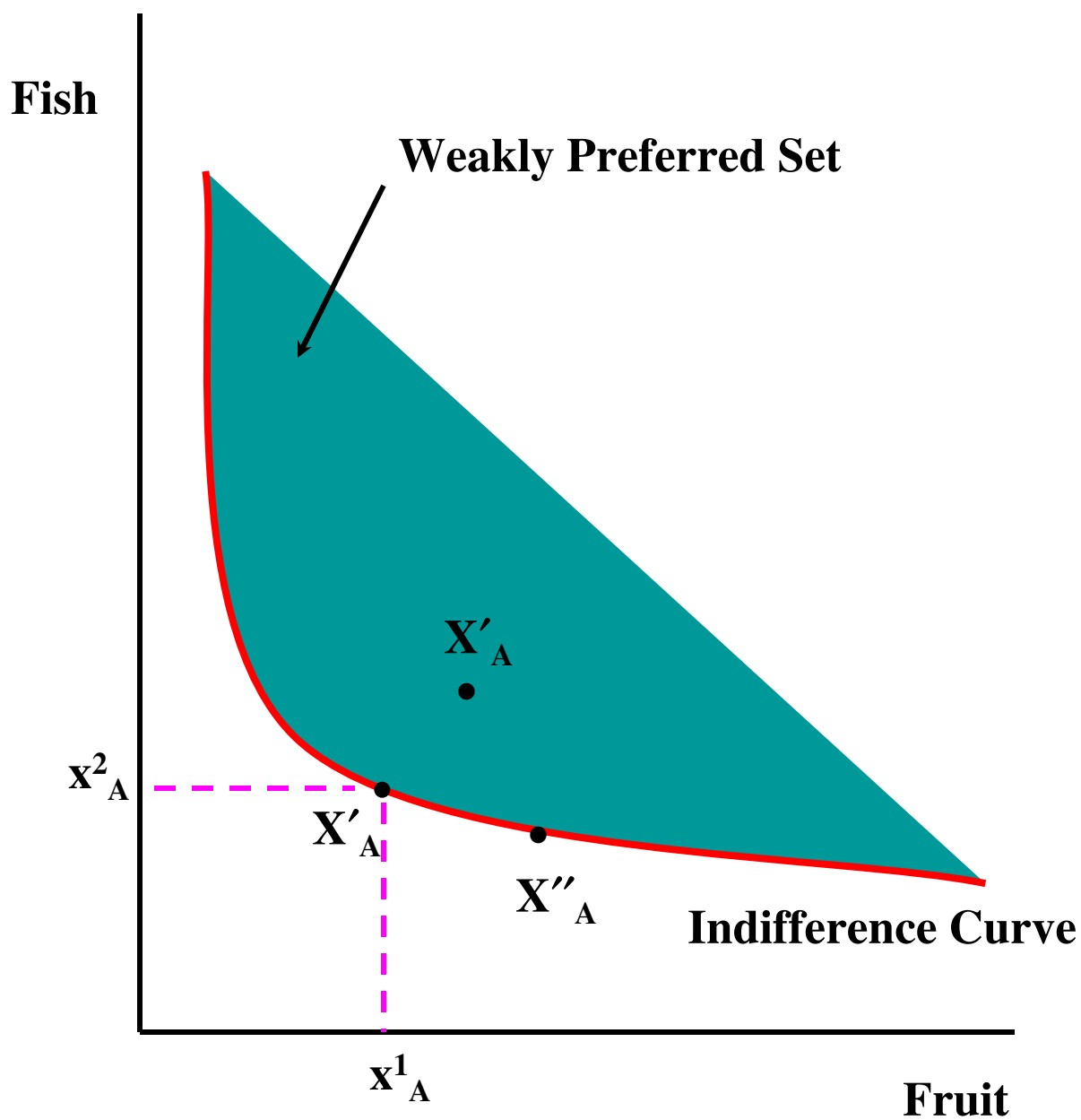
Fruit

■ **Well-behaved preferences have two features:**

☞ **more is better, less is worse, i.e. fruit and fish are "*goods*" not "*bads*"**

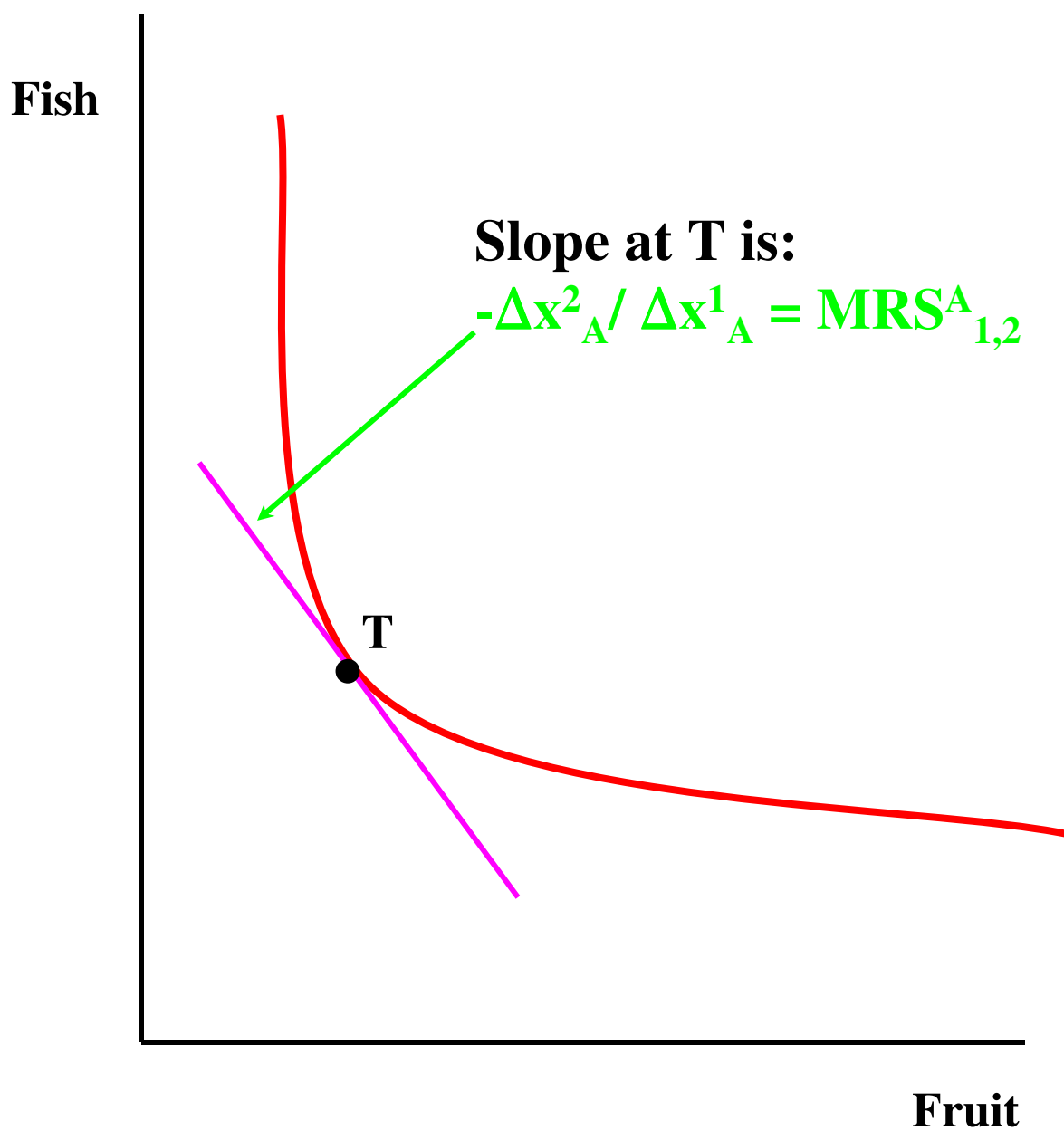☞ **indifference curves are *convex* to the origin**

■ **Convexity relates to the slope of the indifference curve**

☞ **slope of an indifference curve at any one point is the *marginal rate of substitution* of the two goods 1 and 2 - MRS$^A_{1,2}$**

☞ **the marginal rate of substitution is given by the slope of a tangent at a specific point**

$$\text{slope of curve} \quad = \; - \; \frac{\Delta x^2_A}{\Delta x^1_A} = MRS^A_{1,2}$$

MARGINAL RATE OF SUBSTITUTION

Fish

Fruit

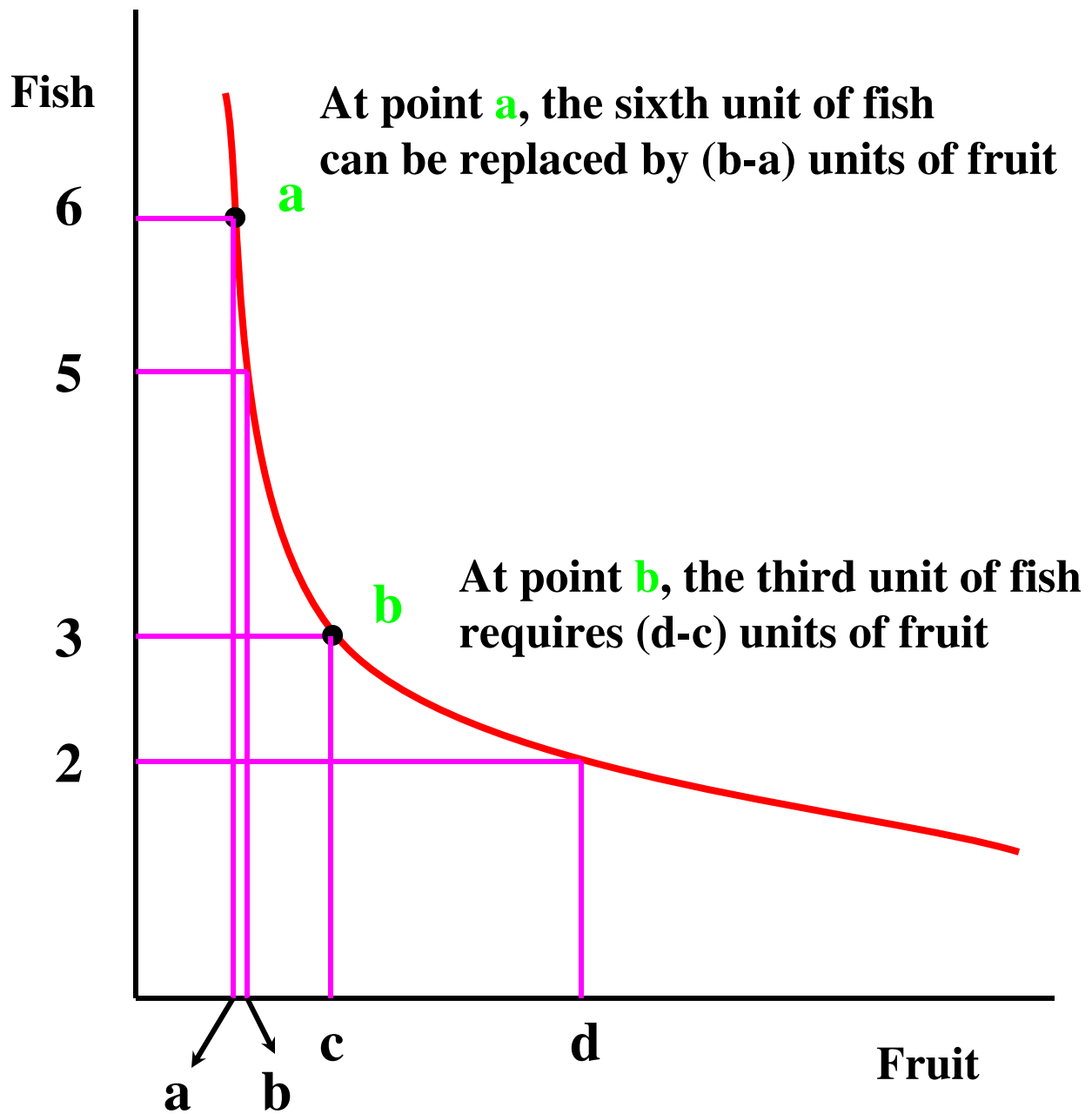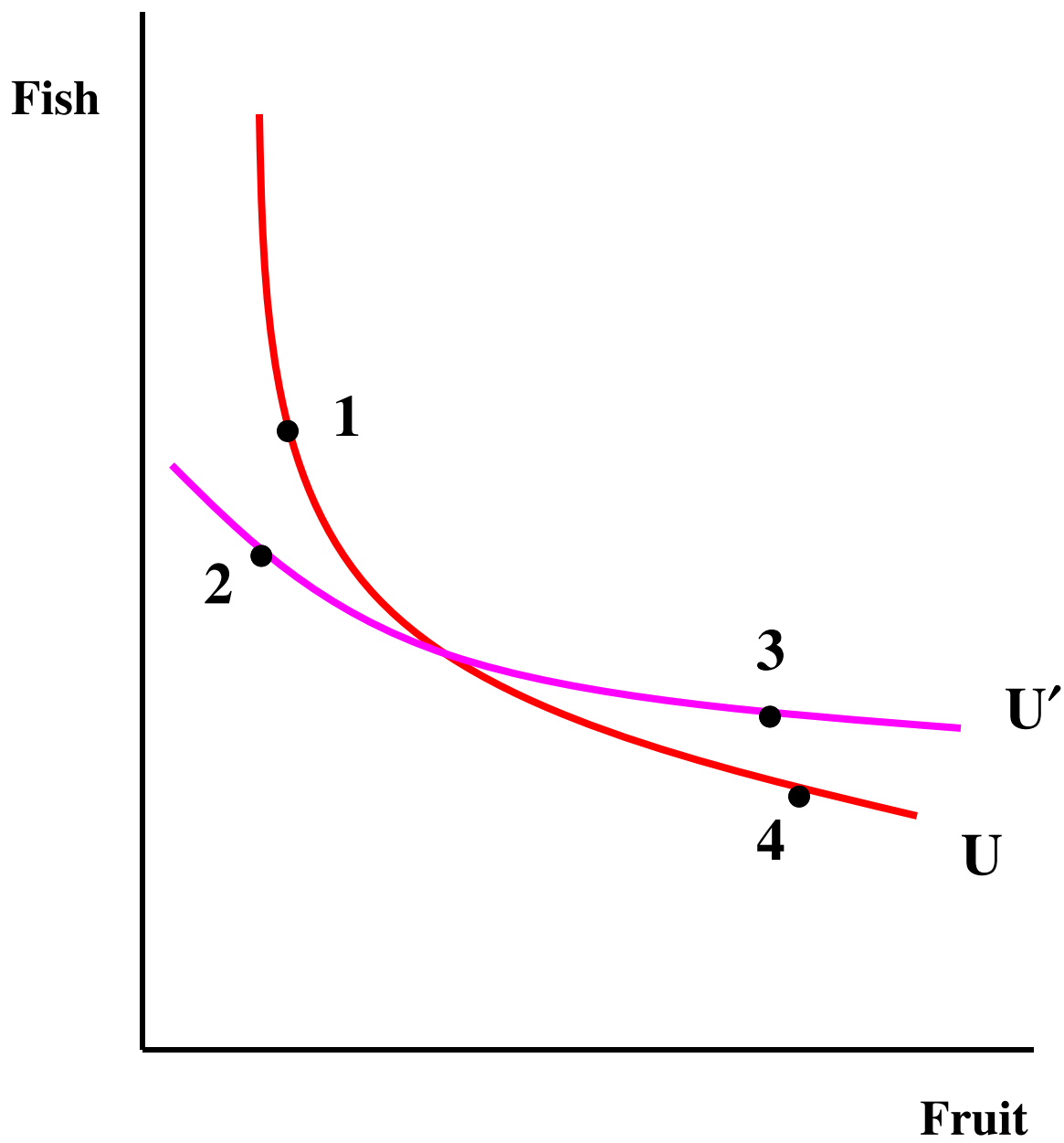**Slope at T is:**

$-\Delta x^2_A / \Delta x^1_A = MRS^A_{1,2}$

T

☞ the marginal rate of substitution of good 1 for good 2 is defined as the number of units of good 2 that must be *given up* in exchange for an *extra* unit of good 1, and keep the consumer on the *same indifference curve*

☞ convexity of the indifference curve means that as one moves down a curve from left to right, its slope decreases (in *absolute* terms), i.e. the marginal rate of substitution is *diminishing*
(see next figure)

☞ the concept of a diminishing marginal rate of substitution is closely related to the concept of *diminishing marginal utility*

$$MRS_{1,2}^{A} = - \frac{\Delta x_{A}^{2}}{\Delta x_{A}^{1}} = \frac{MU_{A}^{1}}{MU_{A}^{2}}$$
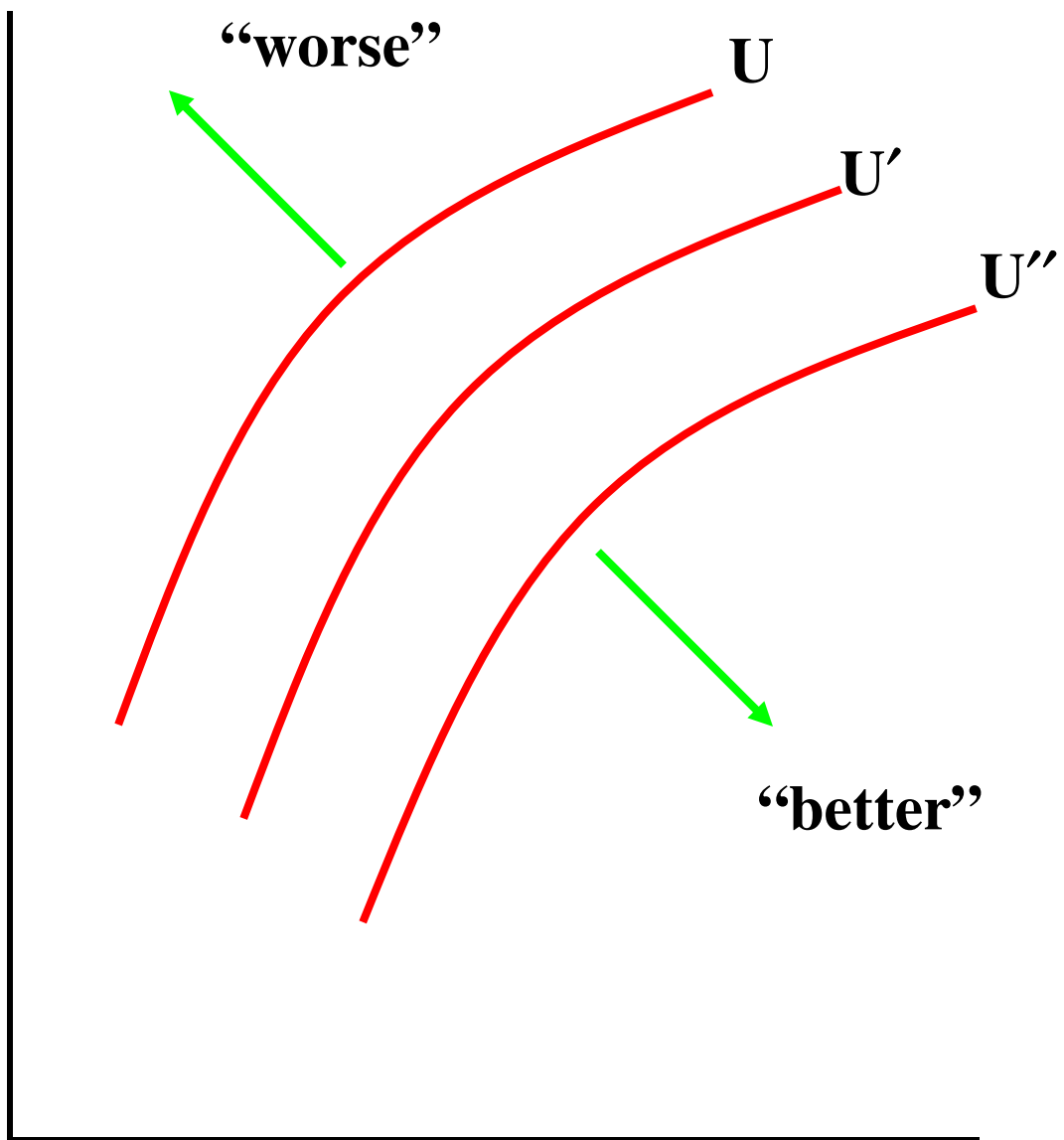
where MU is marginal utility; as more of good 1 is substituted for good 2, the marginal utility of good 1 *declines*, while that for good 2 *increases*

DIMINISHING MARGINAL RATE
OF SUBSTITUTION

Fish

**At point a, the sixth unit of fish
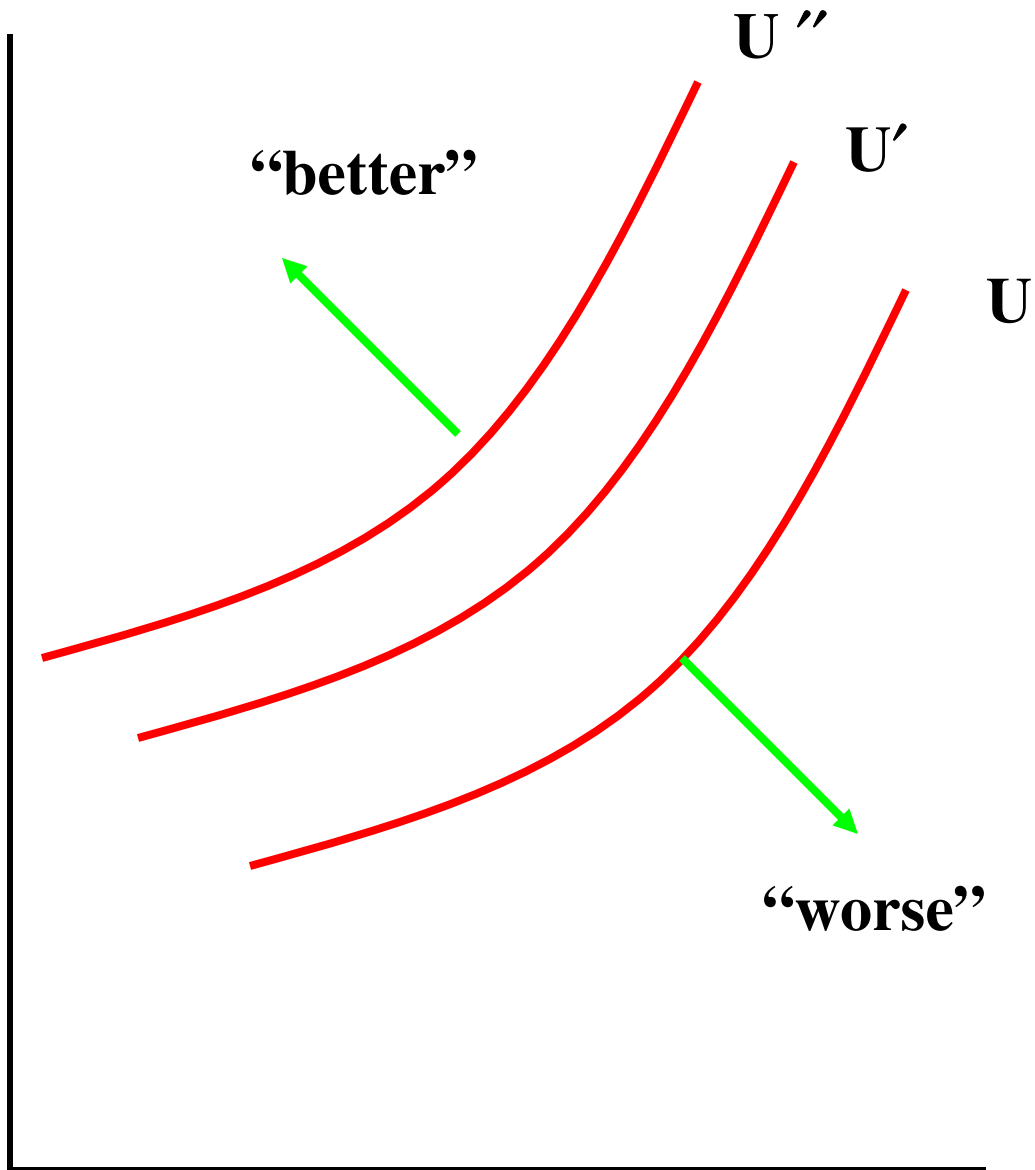can be replaced by (b-a) units of fruit**

a

**At point b, the third unit of fish
requires (d-c) units of fruit**

b

6

5

3

2

a   b   **c**   **d**

Fruit