Economics 51
Summer 1999
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Solution Set: Quiz 1

a. Two utility functions represent the same preferences if "you can get one from the other." More rigorously, if one is a monotonic (order-preserving) transformation of the other. In other words, if they rank any given set of bundles in the same order. Therefore, U2 and U4 represent the same preferences because U4 is simply the square of U2.

From class we know that the utility curves for perfect substitutes are straight lines. Therefore U1 represents perfect substitutes.

The utility curves for perfect complements are L-shaped, therefore U3 represents perfect complements. To see this note that for any given amount of $x_2 \geq x_1$, increasing x_2 does not increase utility. Likewise, for any given $x_1 \geq x_2$, increasing x_1 does not increase utility. The indifference curves for $U3(x_1, x_2) = min(x_1, x_2)$ are therefore L-shaped, with the corners lying along the $x_1 = x_2$ line.

b. Her preferences satisfy transitivity but not convexity.

The transitivity axiom: If $a \succeq b$ and $b \succeq c \Longrightarrow a \succeq c$. Let a=2 pieces of cake, b=2 cups of coffee and c=a cup of coffee and a piece of cake. This follows the formula directly.

Convexity implies that the consumer prefers a balanced bundle over extreme combinations. Nancy, however, prefers a and b over c. If we graph the three bundles, we see that they fall on a straight line. The indifference curve through b passes northeast of c but southwest of a. So the at least as good set delimited by this indifference curve cannot be convex.

c. $U(x_1, x_2) = x_1 x_2^2$. The $MRS = \dfrac{\frac{\partial U}{\partial x_1}}{\frac{\partial U}{\partial x_2}}$

Term by term:

- $\frac{\partial U}{\partial x_1} = x_2^2$
- $\frac{\partial U}{\partial x_2} = 2x_1 x_2$
- $MRS_{x_1 x_2} = \frac{x_2}{2x_1}$

Following the convention of putting x_1 on the horizontal axis, moving along the indifference curve, increases x_1. As we increase x_1 we see that the the slope of the indifference curve, the MRS flattens. The MRS is decreasing as the amount of x_2 that you need to give up for an extra unit of x_1 (while maintaining constant utility) falls.