

ECON 301, Prof. Hogendorn

Problem Set 1

1. *MRS*. Let an individual have the utility function

$$U(X, Y) = X^{1/3}Y^{2/3}$$

- (a) Compute the marginal utility of X when $X = Y = 1$.
 - (b) Compute the marginal utility of Y when $X = Y = 1$.
 - (c) Compute the marginal utility of X when $X = 5$ and $Y = 9$.
 - (d) Compute the marginal rate of substitution when $X = Y = 1$.
 - (e) Compute the marginal rate of substitution when $X = 5$ and $Y = 9$.
2. Buying X and Y. Suppose you have an income of \$40 to spend on two commodities. Commodity X costs \$10 per unit and commodity Y costs \$5 per unit.
- (a) Write down your budget constraint. If you spent all your income on X, how much could you buy? If you spent all your income on Y, how much could you buy? Graph your budget constraint. What is its slope?
 - (b) Suppose the price of X falls to \$5 while everything else stays the same. Write down your new budget constraint. What is its slope? Graph your new budget constraint on the same graph as (a).
 - (c) Suppose your income falls to \$30, but the prices of X and Y remain at \$5. Write down your new budget constraint. What is its slope? Graph your new budget constraint on the same graph as (a) and (b).

- (d) On your graph, shade in the area representing commodity bundles that you can afford with the budget in (c) but could not afford to buy with (a). Shade in the area representing commodity bundles that you could afford with the budget in (a) but cannot afford with the budget in (c).

Review Problem Only, Not to Turn In:

3. Jazz. Suppose that there are two types of jazz music, smooth jazz and traditional jazz. The only jazz radio station in a city plays 10 minutes of smooth jazz for every 10 minutes of traditional jazz. Graph this point (10,10), and then analyze the preferences of the listeners. Assume all listeners have convex preferences, and there are two equal-sized groups of listeners, Group 1 and Group 2.
- (a) At the (10,10) point, Group 1 listeners have an MRS of 1 minute of traditional jazz per 4 minutes of smooth jazz. Graph the group 1 indifference curve through the (10,10) point.
- (b) At the (10,10) point, Group 2 listeners have an MRS of 8 minutes of traditional jazz per 1 minutes of smooth jazz. Graph the group 2 indifference curve through the (10,10) point.
- (c) Suppose the radio station changes its format somewhat and plays 11 minutes of smooth jazz for each 9 minutes of traditional jazz. Which type of listener has moved further in space on the graph from its old indifference curve?
- (d) Can we say which type of listener is better off and which worse off? Can we say whether the gains to one group more than offset the losses to the other? (Be very careful on this last question.)

Answer to Review Problem:

3. Jazz_a

- (a) A nice convex indifference curve.
- (b) The curves cross. Group 2's is steeper.
- (c) If a group had an MRS of -1, then that group would be indifferent to this movement. Both groups have MRSs that differ from -1: group 1's slope is 4 times less and group 2's slope is 8 times more. Thus Group 2's slope differs more and it will therefore move further in space from its old indifference curve (at least using the calculus approximation that is inherent in MRS).
- (d) Group 1 is below its old indifference curve and is therefore worse off. Group 2 is above its old indifference curve and therefore better off. We can't compare utility measures between people, so we can't say whether the gains more than offset the losses.