Econ 303 - Intermediate Microeconomic Theory
College of William & Mary
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Problem Set 1

This problem set will be graded and is due by **5pm** on **Monday, February 4th** in my mailbox in the economics department. You may turn in problem sets early by putting them in my mailbox in the economics department or by dropping them off in lecture. No late problem sets will be accepted. You are welcome to work in groups. If working in a group, everyone in the group must still submit an individual problem set.

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1. **Describing Preferences** For each example below, draw a set of three indifference curves that represent the given preferences. Be certain to show the direction of increasing utility. Also write down a utility function that would be consistent with the given preferences.

   (a) For every can of soda Adam drinks, his utility goes up by one util (a unit of utility). Adam is always willing to trade one candy bar for two cans of soda.

   (b) Bob likes cats but dislikes dogs (every extra cat in his house increases his utility while every extra dog decreases his utility). Each additional cat increases Bob's utility by the same amount, no matter how many cats he has. As the number of dogs in Bob's house increases, he become a bit desensitized to them so that each additional dog lowers his utility by less as the total number of dogs gets larger.

   (c) Carl likes both burgers and hotdogs but experiences diminishing marginal utility of hotdogs and diminishing marginal utility of hamburgers.

2. **Addiction and Indifference Curves**

   Consider a person with preferences over two goods, coffee and cigarettes. Both of these goods are addictive, in other words the more coffee you drink, the more willing you are to give up other goods in exchange for coffee and the more cigarettes you smoke, the more willing you are to give up other goods in exchange for cigarettes.

   (a) What does this addictive behavior imply about the marginal rate of substitution? Is the MRS increasing, diminishing or constant?

   (b) Sketch the indifference curves for this person, with coffee on the vertical axis and cigarettes on the horizontal axis. Include at least two indifference curves and make certain to label the direction in which utility is increasing.

   (c) Are these preferences convex? Would this person prefer an extreme bundle, say 10 cigarettes and no coffee or no cigarettes and 10 cups of coffee, or an average of these extremes (for example 5 cigarettes and 5 cups of coffee)?

3. **Budget Constraints** For each example below, sketch the consumer's budget constraint and answer any questions that are asked. Be certain to label any relevant intercepts, kinks and slopes with the appropriate values.

   (a) Abigail spends all of her money on books and movie tickets. Books cost \$10 each and movie tickets also cost \$10 each. Abigail has a total of \$500 to spend.

   (b) Everything is the same as in part (a) except as a birthday present, Abigail is given a \$20 gift card for the bookstore.

   (c) A friend offers to give Abigail \$15 in cash for the gift card. Sketch Abigail's new budget constraint if she accepts the deal on the same graph you made in part (b). Can you say whether or not Abigail will take the deal? Explain your answer.

   (d) Everything is the same as in part (a), but the bookstore has the following sale: the first 10 books you buy are all \$10 each but after that, any additional books you buy are only \$5 each. Would this sale change the number of books and movie tickets Abigail decides to buy?

4. **The Buffet**

   You have decided to eat sushi for lunch and have a grand total of \$20 to spend. Whatever money you have left over from buying sushi rolls will be spent on cans of soda to get you through the rest of the day. Your problem is to choose the best combination of sushi rolls and cans of soda.

   (a) You decide to head over to Oshio Cafe due to its convenient proximity to the economics department. A sushi roll is \$6 and cans of soda are \$1. Sketch your budget constraint, being certain to label any relevant intercepts. *(*Throughout this problem, assume that you can purchase fractions of sushi rolls and fractions of cans of soda.)

   (b) Let's say that your utility for a bundle of sushi rolls (R) and cans of soda (C) is given by the following function:

   $$U(R, C) = 30R^{\frac{1}{3}}C^{\frac{2}{3}}. \tag{1}$$

   Show that your marginal utility of sushi and your marginal utility of soda are the following:

   $$MU_R = 10\left(\frac{C}{R}\right)^{\frac{2}{3}} \tag{2}$$

   $$MU_C = 20\left(\frac{R}{C}\right)^{\frac{1}{3}} \tag{3}$$

   (c) What combination of sushi and soda maximizes your utility given your budget constraint? Add this optimal point and the indifference curve passing through it to your graph of the budget constraint.

(d) Now suppose that you decided to go to the buffet at Fuji Chef instead. The buffet costs $13. Sketch your new budget constraint. (*Hint: your possible consumption bundles still consist of cans of soda and rolls of sushi.*)

(e) Explain in words what happens to the number of cans of soda and sushi rolls in your optimal bundle, given the utility function in part (b).

(f) Fuji Chef still has sushi left at the end of lunchtime. If we assume that nobody was rushed and everybody got a chance to eat as much sushi as they wanted, something must be wrong with our utility function. After some level of sushi, it must be that more sushi actually makes us worse off. This level of sushi is considered a satiation point. More sushi is good up to this satiation point, the point at which we happily say "I'm full," but bad after this point, when we say instead, "I shouldn't have eaten so much." Sketch one more set of indifference curves where more soda is always better but we have a satiation point for sushi after six rolls. Sketch three or four indifference curves and indicate the direction of increasing utility.