ECON 251: Intermediate Microeconomics
Department of Economics, Lafayette College Spring 2024
Instructor: Prof. Sayorn Chin (he/him/his)

Problem Set 2

Due: 7 Feb (Physical Copy in Class)

Instruction

Work in teams of 2-3 people, provide your responses typed in LaTeX. Handwritten submissions will not be accepted. The primary purpose of the problem sets is to give you experience thinking and working through economic problems. Getting the right answer is much less important than understanding the right answer and how it was derived. Accordingly, problem sets are graded on a combination of effort and accuracy. Your investment or lack of investment in these assignments will determine your success in the course as problem set investment is strongly correlated with exam performance.

1. (2 points) Consider a utility function $u(x_1, x_2) = x_1 x_2$. Explore the mathematical and graphical implications of the following:
    a. (1 point) Show how the bundle $(1, 6)$ is comparable to the bundles $(2, 3)$, $(3, 2)$, and $(6, 1)$.
    b. (1 point) Show how the bundle $(2, 4)$ is comparable to the bundle $(2, 3)$.
2. (4 points) In each of the provided scenarios, a student at Lafayette College purchases two consumption goods labeled as "economics books" and "books about other subjects". Your objective is to construct a logical set of indifference curves (ICs) using the given information. Measure "economics books" along the horizontal axis and "books about other subjects" along the vertical. Graph a minimum of two ICs to denote the direction of higher utility.
    a. (1 point) I like all my courses and the liberal arts education that Lafayette College offers. That is, I prefer to read books on a variety of different subjects, rather than to read lots on one subject and little on the others.
    b. (1 point) I really like books about economics because I want to understand the economic world. Books about other subjects make no difference to me.
    c. (1 point) I hate economics book with calculus and all other economics books. On the other hand, I love everything else in the Lafayette College curriculum.
    d. (1 point) I care only about the total amount of knowledge I acquire. It is the same whether that is economics knowledge or of any other kind. That is, all books on all subjects are perfect substitutes for me.

3. (4 points) Draw indifference curves for utility levels 5 and 10 for each of the following utility functions. Explain in a sentence or two the consumer's preferences for the two goods (x_1, x_2)

   a. (1 point) $u(x_1, x_2) = x_2 - x_1^2$

   b. (1 point) $u(x_1, x_2) = min(x_1, 2x_2)$

   c. (1 point) $u(x_1, x_2) = x_1 + x_2$

   d. (1 point) $u(x_1, x_2) = 2x_2$

4. (6 points) Fatima loves hiking (x_1) and camping (x_2). Her utility function for these two activities is $u(x_1, x_2) = 3x_1^2x_2^4$.

   a. (1 point) Calculate MU_1, the marginal utility of hiking.

   b. (1 point) Calculate MU_2, the marginal utility of camping.

   c. (1 point) Calculate MRS, the rate at which she is willing to substitute camping for hiking to remain at the same utility level.

   d. (1 point) Last month, Fatima hiked 2 hours a day, and camped 4 hours a day. Using your formula for MRS from part (c), find her MRS last month.

   e. (1 point) This month, Fatima is hiking 8 hours a day, and camping 2 hours a day. Calculate her MRS this month. Has her MRS increased or decreased? Explain why.

   f. (1 point) Is Fatima happier or sadder this month compared to last month? Explain.

5. (4 points) Consider Sneha whose preferences are expressed by the following utility function:

$$u(x_1, x_2) = x_1^3x_2^5$$

   a. (1 point) Explain the meaning of MRS in words at the bundle $(x_1, x_2) = (2, 3)$.

   b. (1 point) Use your answer for MRS from part (a) to illustrate it on the graph. Plot "x_1" along the horizontal axis and "x_2" along the vertical.

   c. (1 point) Determine whether good 1 is more or less "valuable" to Sneha compared to good 2 at the given bundle.

   d. (1 point) Calculate approximately how much of good 2 would need to be given to Sneha, after taking away 0.0001 of good 1, to ensure she remains equally satisifed or indifferent.