Intermediate Microeconomics – Spring 2025

Instructor: Yuanning Liang

Problems Set 1

Due Monday March 10th

Instructions:

1. You can either write down your answers by hand or type out your solutions. Please hand in a hard copy of your answers and make sure your work is stapled. Alternatively, you can submit a digital copy to the TA via email. Most importantly, please remember to indicate your name and student number on your homework.

2. The problem sets should be submitted to the TA before the beginning of the lecture on the due day. Late submissions will NOT be accepted. If you have any emergency that prevents you from coming to the lecture, please email an electronic version of your problem set to the TA before the class.

3. You are encouraged to discuss with your classmates, but please write down your answers individually. Directly copying others' answers may result in zero points.

Question 1 (Utility functions)

Do the following utility functions represent the same preferences?

Please provide your reasoning.

(a) $u(x; y) = xy$, $v(x; y) = 3(xy)^2 + 6$

(b) $u(x; y) = xy$, $v(x; y) = -3(xy)^2 + 6$

(c) $u(x;y)=xy$, $v(x;y)=\ln x+\ln y$

(d) $u(x; y) = xy$, $v(x; y) = x + y$

Question 2 (Indifference curves)

Well-behaved indifference curves (monotonic and convex) are downward sloping. True or false?

Please prove your answer.

Question 3 (Budget Sets) This question concerns a consumer who is choosing how many of two goods to buy: Footballs (the round ones, that you kick with your foot) and cricket balls (like baseballs, but better). The consumer has an income of $20, and the cost of a football is $4 and a cricket ball is $2

1.Write down the equation for the consumer's budget constraint and graph it in the commodity space.

2.The government decides that football is evil and needs to be taxed. They introduce a 50% tax on each football sold. Rewrite and re-graph the budget constraint.

3.A new government is elected that hates all sports. They now tax both footballs and cricket balls at 50%. What does the budget constraint look like now?

4.Due to a threat of revolt amongst sports fans, the government hands out a subsidy of $10 to the consumer. What does their new budget constraint look like? How would you expect consumer behavior to differ between this situation and the no-tax, no-subsidy situation described in part 1?

5.Revolution comes, and all taxes and subsidies are abolished. Even better, the consumer finds a new shop that offers bulk discounts. In this shop, footballs cost $4 each if you buy 3 or fewer. However, the cost of any additional football after 3 is $2. What does the budget set look like now? graph it in the commodity space.

Question 4 (UMP) Edmund consumes two commodities, sewage and punk rock video cassettes. He doesn't drink sewage of course, but he gets paid for taking it away at $2 per ton. Edmund can accept as much sewage as he wishes at that price. He has no other source of income. Video cassettes cost him $6 each. He has a utility function $u(s, v)$ on sewage (s) and videos (v) which is decreasing in s and increasing in v.

1. If Edmund's accepts 0 tons of sewage, how many video cassettes can he buy?

2. Write down Edmund's constrained optimization problem.

3. Draw Edmund's budget line and shade his budget set.

Question 5 (UMP). A consumer has utility function u(x,y) = $x^{\frac{1}{2}}y^{\frac{1}{2}}$. Let the prices of goods x and y be given by p_x and p_y respectively, and let m denote the consumer's wealth. Assume that p_x , p_y and m are all strictly positive.

1. Write down the consumer's utility maximization problem.

2. Derive the consumer's optimal choice of x and y.

3. Are there any prices and wealth (p_x , p_y and m) at which good x is a Giffen good? Briefly explain why.