

Problem Set for Midterm Exam

1. A consumer has the utility function $U(x, y) = xy$. Income of the consumer is 72 TL, while price of good y is 1 TL per unit. Suppose that the price of x is initially 9 TL. Then the price falls to 4 TL. Find the numerical values of the income effect and substitution effect. Graph your findings and write down the economic meaning of each result.
2. A consumer has the utility function $U = \sqrt{x} + y$.
 - a. Derive the demand functions for x and y .
 - b. Are x and y complements or substitutes?
 - c. Are x and y normal or inferior?
3. Consider an individual who Works for H hours a day. So, her leisure-time is $L = 24 - H$ per day. If she consumes C amount of consumption goods, her utility is
$$U(C, L) = \ln(C) + L.$$
 - a. Express the budget constraint if the price of consumption is p and the hourly wage is w .
 - b. Express the utility maximization problem.
 - c. Solve the utility maximization problem to derive the labor supply.
 - d. What is the price elasticity of demand for consumption?

(Similar problems: Saving-investment decision with Cobb-Douglas utility).
4. Cansel loves cheese sandwiches. A cheese sandwich is made of 2 loafs of bread and 1 slice of cheese. The price of bread is P_B and the price of cheese is P_C . Cansel's income is $I = 18$ TL for preparing cheese sandwiches.
 - a. Write down a utility function of Cansel for consuming cheese sandwich.
 - b. Plot indifference curves for Cansel's utility function at $U = 4$ and $U = 6$.
 - c. Write down her budget constraint.
 - d. Compute the demand curve for cheese.
 - e. Is cheese and bread complements or substitutes (Hint: You should look at the cross-price elasticity)
 - f. Assume the price of cheese falls d own to $P_C = 2$ from $P_C = 4$. Calculate the substitution effect given that $P_B = 1$. Interpret your result.

(Similar problems: The same question with $U(C, B) = \ln(C) + B$. You can also play with the numbers)
5. Ed's utility from vacations (V) and meals (M) is given by the function $U(V, M) = V^2M$. Last year, the price of vacations was \$200, and the price of meals was \$50. This year, the price of meals rose to \$75, the price of vacations remained the same. Both years, Ed had an income of \$1500.
 - a. Calculate the change in consumer surplus from meals resulting from the change in meal prices.
 - b. What is the compensating variation for the price change in meals?
 - c. Calculate the equivalent variation for the price change in meals.

6. Amazon can deliver packages using drones, or standard courier services. A drone can deliver 20 packages per day, and a human courier can deliver 15 packages per day. The amount of packages delivered per day is Y , number of drones is D , and number of couriers is L . They are equally fast.
- Write down a production function $Y = F(D, L)$ representing this relation.
 - What is the marginal rate of technical substitution of L for D ?
 - Draw isoquants for $Y = 45$ and 60 .
 - If the price of D and L are equal, then what is the cost minimizing amount of L ?

(Similar questions: Production function can be Leontief, or Cobb-Douglas)

7. Assume that the production technology is $Y = K + \sqrt{L}$.
- What is the returns to scale?
 - Find marginal productivities.
8. The production function of a firm is given by $Q = KL + M$. The input prices of K , L , and M are 4, 16, and 1, respectively.
- The firm is operating in the short run, with K fixed at 20 units. What is the short-run total cost of producing 400 units of output?
 - What would total cost be if the firm were operating in the long run?

9. Suppose that the number of cars that use a certain bridge is

$$Q = 200 - T$$

where T is the level of toll per car. This is the demand curve for the bridge where T is the price.

- What is the maximum amount that the society would be willing to pay for the construction for this bridge if the bridge is toll-free?
 - Answer the same question when $T = 10$.
 - Interpret your results.
10. Consider the linear demand curve $Q = 360 - 6P$.
- What is the price elasticity of demand at $P=40$?
 - In what direction and at what rate should the price be changed to maximize total revenue?