

ECON 203.01 - Problem Set 1

February 23, 2026

1. Draw some indifference curves for bundles of the following commodities (Note: In all cases, assume that the goods are perfectly divisible).

- (a) Good 1: Left Gloves, Good 2: Right Gloves (Assume that the consumer has one left hand and one right hand)
- (b) Good 1: 10 TRY, Good 2: 50 TRY
- (c) Good 1: Left shoes, Good 2: Right shoes (Assume that the consumer has two left feet)
- (d) Good 1: Left shoes, Good 2: Right shoes (Assume that the consumer has two left feet and one right foot)
- (e) Good 1: Water, Good 2: Orange juice

2. Tom always begins his day with a strawberry milkshake. He makes it by mixing milk (x) with five strawberries (y). The secret of a really good milkshake lies in the optimal proportion of milk and fruit: one glass always comes with five strawberries.

- (a) Plot Tom's representative indifference curves. Depict three indifference curves that pass through the following bundles (5, 1), (10, 10), and (15, 4). What is the MRS at each of these points?
- (b) What utility function represents these preferences? On the graph from (a), indicate the level of utility corresponding to each indifference curve.
- (c) Multiply your utility function by ten and add two to it. How did the indifference curves change? How was the level of utility associated with each indifference curve affected?

3. Kate has two favorite kinds of apples: Fuji (x) and Gala (y). Kate loves them both and actually does not distinguish between the two kinds.

- (a) In a graph, show Kate's indifference that passes through (2, 3) and (3, 3).
- (b) Suggest two different utility functions that represent Kate's preferences.
- (c) Find the marginal rate of substitution.

4. Gin likes chocolate cake and ice cream, but after 10 slices of cake, he gets tired of cake and eating more cakes makes her less happy. Gin always prefers more ice cream to less. Gin's parents require him to eat everything put on his plate

- (a) Draw a set of indifference curves that depict his preferences between plates with different amounts of cake and ice cream.
- (b) Suppose that Gin's preferences are as before, but now his parents allow him to leave anything on his plate that he doesn't want. Draw some indifference curves to show his preferences between plates with different amounts of cake and ice cream.

5. Draw the indifference curves for each of the following utility functions.

- (i) $U(x, y) = x + 2y$
- (ii) $U(x, y) = \min\{2x + y, 2y + x\}$
- (iii) $U(x, y) = \max\{2x + y, 2y + x\}$
- (iv) $U(x, y) = x + \min\{x, y\}$
- (v) $U(x, y) = (x - 1)^2 + (y - 4)^2$

6. Find the Marshallian demand functions for the given utility functions.

- (a) $U(x_1, x_2) = x_1^{1/4} x_2^{3/4}$
- (b) $U(x_1, x_2) = 3x_1 + x_2$
- (c) $U(x_1, x_2) = \min\{2x_1, 3x_2\}$
- (d) $U(x_1, x_2) = x_1 + x_2 + \sqrt{x_2}$
- (e) $U(x_1, x_2, x_3, x_4) = \sqrt{x_1 x_2} + \sqrt{x_3 x_4}$
- (f) $U(x_1, x_2) = e^{(x_1 + \ln(x_2))^{1/3}}$

7. Assume that the utility function of a consumer is given by $U(x_1, x_2) = x_1^{\frac{1}{3}} x_2^{\frac{1}{3}}$. The consumer has $m = 36$ Liras to spend, and the prices of the goods are as follows: $p = (p_1, p_2) = (2, 4)$.

- (a) Write down the utility maximization problem of the consumer.
- (b) Setup the Lagrangian and write down the necessary first-order conditions (there are three of them).
- (c) Solve for the optimal consumption bundle $(x_1(p, m), x_2(p, m))$.

8. Assume that the utility function of a consumer is given by $U(x_1, x_2) = \min\{x_2 + 2x_1, x_1 + 2x_2\}$.
- Draw an indifference curve where the utility is equal to 20.
 - What is the condition on $p_1 = p_2$ for the consumer to have $x_1 = 0$ in her optimal consumption bundle?
 - What is the condition on $p_1 = p_2$ for the consumer to have $x_2 = 0$ in her optimal consumption bundle?
 - If the optimal consumption bundle is unique and $x_1 > 0, x_2 > 0$, what is the value of $x_1 = x_2$?
9. Suppose that a consumer only consumes good 1 and good 2 under the following prices and income: $p_1 = 2, p_2 = 1$, and $m = 100$. Consumer's preferences can be represented by the utility function $u(x_1, x_2) = 3x_1 + x_2$.
- Find the optimal bundle.
 - Now suppose that the consumer receives a coupon of \$20, which can be spent only on good 2. Draw the new budget constraint and find the new optimal consumption bundle.
10. Leo consumes only nuts and berries. Fortunately, he likes both goods. The consumption bundle where Leo consumes x_1 units of nuts per week and x_2 units of berries per week is written as (x_1, x_2) .
- The set of consumption bundles (x_1, x_2) such that Leo is indifferent between (x_1, x_2) and $(16, 4)$ is the set of bundles such that $x_1 \geq 0, x_2 \geq 0$, and $x_2 = 20 - 4\sqrt{x_1}$. Plot several points that lie on the indifference curve that passes through the point $(16, 4)$ and sketch this curve.
 - In fact, Leo's preferences can be represented by the utility function $u(x_1, x_2) = 4\sqrt{x_1} + x_2$. The price for nuts is \$1 per unit, and the price for berries is \$2 per unit. Leo has \$24 to spend on the two goods. Write down Leo's budget constraint and solve for his optimal consumption bundle.
 - Now Leo has only \$9 to spend. Is he still be able to consume the same amount of units as in part (b)? Explain.