

# Advance Microeconomics 2023/2024 - EFE

## Homework I

### Budget Constraint - Preferences - Utility

#### Exercise 1 (Budget Constraint I)

Draw budget lines for the following cases, where  $p$  is the price of good  $x$  and  $q$  is the price of good  $y$ ,  $I$  is your income, and  $x$  and  $y$  are the only two goods in the world.

- (a)  $p = 3, q = 3, I = 10$
- (b)  $p = 1, q = 4, I = 10$
- (c)  $p = 4, q = 0, I = 10$
- (d)  $p = q, I = 5q$

#### Exercise 2 (Budget Constraint II)

Originally the consumer faces the budget line  $p_1x_1 + p_2x_2 = m$ . Then the price of good 1 doubles, the price of good 2 becomes 8 times larger, and income becomes 4 times larger. Write down an equation for the new budget line in terms of the original prices and income.

#### Exercise 3 (Budget Constraint III)

Suppose the budget line is  $p_1x_1 + p_2x_2 = m$ . What happens to the budget line if the price of good 2 increases, but the price of good 1 and income remain constant? What if the price of good 1 doubles and the price of good 2 triples, does the budget line become flatter or steeper?

#### Exercise 4 (Budget Constraint IV)

Olivier, a professional goalkeeper, consumes only two products: granola ( $x_1$ ) and bottled water ( $x_2$ ). He has a total of €200 to spend each week, and currently, the price of granola is €4 per pound, while bottled water sells for €2 per bottle.

- (a) Write down an equation representing Olivier's budget constraint. Draw her budget set and budget constraint.
- (b) Suppose that, following a dispute with his agent, Olivier's disposable income falls to €200 per week. At the same time, the price of bottled water drops to €1 per bottle. Write down an equation for Olivier's new budget line, and sketch the new line in the same diagram used in part (a). At what point do the two lines intersect (i.e. find the coordinates of the point)?
- (c) Assume that Olivier's income and the prices of the two goods have all returned to their original levels (€300, €4 and €2). In an effort to promote healthy living, the Swiss government has decided to implement a new program which will subsidize granola consumption by €2 per pound, up to 30 pounds per person. At the same time, so as not to encourage people to consume too much granola, the government enacted a €4 per pound tax on all granola consumption beyond 60 pounds per person. On a new diagram, carefully sketch Olivier's budget constraint in this new era of active government. Be sure to label any points where "kinks" occur; also, calculate (and write down) the slope of each segment of the budget line.

**Exercise 5** (Preferences I)

Consider a group of people A, B, C and the relation “at least as tall as,” as in “A is at least as tall as B.” Is this relation complete? Is it reflexive? Is it transitive?

**Exercise 6** (Preferences II)

Ivan is deeply disgusted by anyone eating oats for breakfast. In fact, his disgust is so dramatic that owning any oats will actually make him worse off. Putting oats on the horizontal axis, graph three indifference curves representing his preferences in a world where the only two goods are oats and croissants (assume that Ivan likes croissants). Label the indifference curves to indicate which is more desirable. What would it look like for Peter who instead likes oats but hates croissants?

**Exercise 7** (Utility functions I)

Sketch a set of level curves (that is, at least two distinct curves) for each of the following utility functions. Draw your curves as closely to scale as possible, and indicate the direction of increasing preferences in each of your diagrams.

(a)  $U(x_1, x_2) = x_1 + 3x_2$

(b)  $U(x_1, x_2) = x_1^{1/2}x_2^{1/2}$

(c)  $U(x_1, x_2) = \frac{x_2}{x_1}$

(d)  $U(x_1, x_2) = y + \ln(x)$

**Exercise 8** (Utility functions II)

What kind of preferences are represented by a utility function such that  $U(x_1, x_2) = \sqrt{x_1 + x_2}$ ? What about the utility function  $v(x_1, x_2) = x_1 + \sqrt{x_2}$ ?

**Exercise 9**

Consider the utility function  $U(x_1, x_2) = \sqrt{x_1x_2}$ . What kind of preferences does it represent? Is the function  $V(x_1, x_2) = x_1^2x_2$  a monotonic transformation of  $U(x_1, x_2)$ ? Is the function  $W(x_1, x_2) = x_1^2x_2^2$  a monotonic transformation of  $u(x_1, x_2)$ ?