

Microeconomics 1A Exam - December 10th, 2021
- 2021/2022

Please solve all exercises below. **Motivate all your answers.**

You have **1 hour 30** to provide your solutions.

The exam is closed book and closed notes. There are three exercises (see the other side of the sheet)

Exercise 1 (30 minutes)

Consider a consumer whose utility depends on its level of consumption of a generic good $x \in \mathbb{R}_+$ and on the quantity of labour she supplies $y \in \mathbb{R}_+$ according to the utility function

$$u(x) = \log x - \gamma y^2.$$

where $\gamma \geq 0$

- (a) Are the preferences represented by u rational ?
- (b) Is the utility function locally non-satiated ? monotonous ? strictly monotonous ?
- (c) Is the utility function u convex ? strictly convex ?
- (d) Determine the demand of the consumer ?
- (e) State the WARP in the framework of the demand?
- (f) Does the demand function of the household computed in (d) satisfy WARP ?

Exercise 2 (30 minutes)

A firm produces a single output with one input $z \geq 0$. The production function $f(z)$ is:

$$f(z) = \begin{cases} \alpha & \text{if } z \geq 1 \\ \alpha z^2 & \text{if } 1 \geq z \geq 0 \end{cases}$$

with $\alpha > 0$.

- (a) Determine and draw the production set Y defined by the production function. Check if the production set satisfy the property of *inaction* and explain the significance and the implication of the property of *inaction*.
- (b) Define the profit of the firm and without solving analytically the firm's profit maximization problem determine graphically whether or when the firm's profit is: *i*) positive and finite; *ii*) 0; *iii*) $+\infty$ (infinite). Motivate your answer.
- (c) For a generic output level greater than zero and less than α , compute the conditional demand factor of the firm and the firm's cost function.

Exercise 3 (30 minutes)

We consider Leontieff preferences over \mathbb{R}_+^2 defined by

$$\forall (x_1, x_2), (y_1, y_2) \in \mathbb{R}_+^2 \quad x \succ y \Leftrightarrow \min(x_1, x_2) \geq \min(y_1, y_2).$$

- (a) For a given $x \in \mathbb{R}_+^2$, determine and draw the indifference set $I(x)$ and the upper contour set $U(x)$.
- (b) Show that this preference relation is continuous, convex, monotone.
- (c) Is this preference relation strictly convex ?
- (d) Is this preference relation strictly monotone ?