# Pontificia Universidad Católica del Perú
# Economics Major

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**Test 3 - v.2**
**ECO 263**

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*Exercise* 1. **(4 points)** Awnser with full detail the following questions:

1. Manuel wants to go on a safari to hunt elephants in Africa. His friend Leonidas tries to dissuade him, arguing that such a practice leads to the extinction of these animals. However, Manuel claims that legal hunting contributes to species conservation, as it makes businesses like safaris (which care about species preservation) profitable. **Comment who is right and why.**

2. Analyze the truth of the following statement: *the existence of the free rider creates the public goods problem*.

3. In an economy, there are only two individuals, Alex and Brian, and their marginal valuations for the tenth unit consumed of a public good are 20 and 19 dollars, respectively. Explain the condition required for the optimal production to be 10 units.

4. Your neighbors are concerned about the increase in the number of robberies in your neighborhood. There are 30 families on your street, each willing to pay USD 3 for additional lighting, regardless of the number of light fixtures ultimately installed. If the cost of providing $x$ light fixtures is given by $c(x) = x^3$, what is the Pareto-efficient number of light fixtures that should be provided? Explain.

*Exercise* 2. **(4 points)** A municipality has 100 inhabitants, whose utility function is given by:

$$u_j(x, y) = xy_j,$$

for $j = 1, \ldots, 100$, which depends on the consumption of a public good $x$ and a private good $y$. Additionally, the unit prices of $x$ and $y$ are USD 100 and USD 20,

respectively. Each inhabitant generates an income of USD 200, which must be fully paid to the municipality as taxes. The municipality uses the tax revenue to purchase $x$ and $y$ and allocates them equitably among all inhabitants.

a) Find the socially efficient provision of $x$. *Hint:* $\sum_{j=1}^{100} j^{-1} \approx 5$.

b) If migration causes the district to host 100 new inhabitants, will the optimal provision of public goods double?

*Exercise* 3. **(4 points)** There are $N$ individuals who decide to live together in a shared house. The utility function for each individual is given by:

$$u(W, A) = 0.2 \ln(W) + 0.8 \ln(F),$$

where $W$ is the number of windows in the house (a public good), and $F$ is the amount of food consumed by each individual (a private good). Additionally, each person has an income of 500, the price of a window is $p_W = 100$, and the price of food is $p_F = 10$.

a) What would the consumption levels be if each individual lived alone?

b) Prove that if they live together, the efficient quantity of the public good (windows) equals the number of people sharing the house.

*Exercise* 4. **(4 points)** Consider a scenario where two individuals, with endowments $w_1, w_2, w_3$, are evaluating the provision of a public good $G$ whose cost is $C = 1000$ soles. The individuals have preferences that depend on the money $m^i$ and on $x \in \{0, 1\}$:

$$u_i(m_i, G) = m_i + 500 \left(\frac{9}{4}\right)^i G, \ i = 1, 2.$$

(a) Find the reservation price of each individual. Then, assume that $s_i = r_i / \sum_i r_i$. Is the public good provided? What is the issue with this mechanism?

(b) Suppose the Groves-Clarke mechanism is applied. Express mathematically the profit function of each individual.

*Exercise* 5. **(4 points)** Let the Bernouilli utitliy function $u : X \to \mathbb{R}$ be defined as

$$u(z_i) = \frac{z_i^{1-\sigma} - 1}{1 - \sigma}, \quad \sigma \in [0, 1).$$

Find:

(a) The coefficient of absolute risk aversion (CAAR).

(b) The coefficient of relative risk aversion (CARR).

(c) Let $\theta \in [0, 1]$. Find the certainty equivalent of a lottery that offers 50 dollars with probability $\theta$ and 0 dollars with probability $1 - \theta$.