OPTIMITZACIO
Fall 2023
Exercises: Constrained optimization, Lagrange multipliers

Due: **5.12.2023 , 23:59h**, in the virtual campus

Exercise 4.1: Using necessary and sufficient conditions, solve the following optimization problem in terms of the parameter $\beta > 0$.
$$f(\mathbf{x}) = (x_1 - 1)^2 + x_2^2 \rightarrow min , \quad \mathbf{x} \in \mathbb{R}^2,$$
subject to
$$h(x_1, x_2) = -x_1 + \beta x_2^2 \geq 0.$$
Interpret the solutions geometrically in terms of the level curves and the restrictions.

Exercise 4.2: Using necessary and sufficient conditions, solve the following optimization problem: for $\mathbf{x} = (x_1, x_2)$,
$$f(\mathbf{x}) = x_1 \rightarrow min$$
subject to mixed constraints
$$g_1(\mathbf{x}) = (x_1 - 3)^2 + (x_2 - 2)^2 - 13 = 0, \quad h_1(\mathbf{x}) = 16 - (x_1 - 4)^2 - x_2^2 \geq 0.$$