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Tutorial 10
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Problem 1. (Optimality conditions) Consider the optimization problem

$$\text{minimize } x_1^2 + x_2^2$$
$$\text{subject to } (x_1 - 1)^2 + (x_2 - 1)^2 \leq 1,$$
$$(x_1 - 1)^2 + (x_2 + 1)^2 \leq 1$$

with variable $x \in \mathbb{R}^2$.

a) Sketch the feasible set and level sets of the objective. Find the optimal point x^* and the optimal value p^*.

b) Give the expression of the associated Langrangian and state the KKT conditions. Do there exist Lagrange multipliers λ_1^* and λ_2^* that prove that x^* is optimal?

c) Derive and solve the Lagrange dual problem. Does strong duality hold?