

Advanced Optimization - Assignment 3

1. Consider the problem

$$\min_{x \in \mathbb{R}^2} f(x) = -2x_1 + x_2,$$

subject to

$$\begin{aligned} (1 - x_1)^3 - x_2 &\geq 0, \\ x_2 + 0.25x_1^2 - 1 &\geq 0. \end{aligned}$$

The optimal solution is $\hat{x} = (0, 1)^T$, where both constraints are active.

- (a) Do the LICQ hold at this point?
- (b) Are the KKT conditions satisfied?
- (c) Write down the sets $\mathcal{F}(\hat{x})$ and $\mathcal{C}(\hat{x}, \hat{\lambda})$.
- (d) Are the second-order necessary conditions satisfied?
- (e) Are the second-order sufficient conditions satisfied?