

The background of the slide is a faded image of the Jiaotong University gate. The gate is a large, white, curved structure with the university's name in English, "JIAOTONG UNIVERSITY", on the right side and in Chinese, "交通大学", on the left side. The gate is flanked by trees and a building with a red roof. A large, dark purple rectangular box is superimposed over the center of the image, containing the title "作业9" in yellow text.

作业9

2021-2022学年第2学期

1. (教材210页习题第1题)考虑问题:

$$\begin{aligned} \min \quad & -x_1x_2x_3 \\ \text{s.t.} \quad & 72 - x_1 - 2x_2 - 2x_3 = 0 \end{aligned}$$

求出外点罚函数方法 $\mathbf{x}(\sigma)$ 的显示表达式. 当 $\sigma \rightarrow \infty$ 时, 求出问题的最优解以及相应的Lagrange乘子. 给出 σ 的取值范围, 使得矩阵 $\nabla_{\mathbf{x}}^2 P_E(\mathbf{x}(\sigma), \sigma)$ 正定.

2. (教材211页习题第4题) 对问题:

$$\begin{aligned} \min \quad & 2x_1 + 3x_2 \\ \text{s.t.} \quad & 1 - 2x_2 - x_2^2 \geq 0. \end{aligned}$$

考虑对数障碍函数方法. 当 $\mu \rightarrow 0$ 时, 求出问题的最优解以及相应的Lagrange乘子.

3. (教材211页习题第7题)对倒数障碍函数 $B_I(\mathbf{x}, \mu)$, 证明:
在点 $\mathbf{x}^{(k)}$ 处, Lagrange乘子估计为:

$$\lambda_i^{(k)} = \frac{\mu_k}{(c_i^{(k)})^2}, i \in \mathcal{I}$$

由此证明对: $\mathbf{x}^{(k)} \rightarrow \mathbf{x}^*, \lambda^{(k)} \rightarrow \lambda^*$, 若 $i \notin \mathcal{I}^*$, 则 $\lambda_i^{(k)} \rightarrow 0$, 且 \mathbf{x}^*, λ^* 为KKT对.