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Preliminary Definitions

Definition. *A matrix, $A \in \mathbb{R}^{m \times n}$ is positive semidefinite if:*

$$\forall x \in \mathbb{R}^n,\, x^T A x \geq 0$$

Definition. *A function f is affine if*

$$f(v) = Av + b$$

for some matrix A and some vector b.

Definition. *For some minimisation problem with objective function $f : \mathbb{R}^n \to \mathbb{R}$ and inequality constraints $g_i : \mathbb{R}^n \to \mathbb{R}$ and equality constraints $h_j : \mathbb{R}^n \to \mathbb{R}$ that are continuously differentiable at the optimal solution $x^\star$ the KKT conditions are (providing some constraints hold): $\exists\ \mu_i$ and λ_i such that*

$$\begin{aligned} \nabla f(x^\star) + \sum_{i=1}^{m} \mu_i \nabla g_i(x^\star) + \sum_{j=1}^{l} \lambda_j \nabla h_j(x^\star) = 0 \quad &\textit{(stationarity)} \\ g_i(x^\star) \leq 0 \\ h_j(x^\star) = 0 \\ \mu_i \geq 0 \\ \mu_i g_i(x^\star) = 0 \end{aligned}$$

Definition. *Rates of convergence*

Definition. *Multivariate Taylor's Theorem*

Definition. *Interior Point*

Definition. *Linear Programming*

Definition. *Quadratic Constrained Programming*