NUMERICAL OPTIMISATION
ASSIGNMENT 8

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EXERCISE 1

Consider a problem to minimise the function

$$\min_x f(x) = \frac{1}{2}x^T G x + c^T x$$

subject to the constraint

$$Ax \leq b,$$

where $G \in \mathbb{R}^{n\times n}$ symmetric positive semidefinite, $A \in \mathbb{R}^{m\times n}, c \in \mathbb{R}^n, b \in \mathbb{R}^m$.

(a) State the KKT conditions for this problem. **[20pt]**

(b) Rewrite the constraint using a vector of slack variables $y \in \mathbb{R}^m, y \geq 0$ and give the corresponding KKT conditions. **[20pt]**

(c) Formulate the dual to the problem in (b) and discuss its properties. **[20pt]**

EXERCISE 2

Solve the following constraint minimisation problem:

$$\min_{(x,y)} f(x,y) = (x-2y)^2 + (x-2)^2, \quad x - y = 4.$$

(a) Formulate the KKT system. **[20pt]**

(b) Solve the KKT system with a method of your choice. Explain briefly your approach. **[20pt]**

Remark. Submit your solutions via `Turnitin`. This submission should not be longer than 4 pages.