

# NUMERICAL OPTIMISATION ASSIGNMENT 8

MARTA BETCKE  
KIKO RUL-LAN

## EXERCISE 1

Consider a problem to minimise the function

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

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]

<https://powcoder.com>

## EXERCISE 2

Solve the following constraint minimization 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.