Submit your work on Catcourses by March 31st at 11:59pm

Read entirely the homework assignment first !

This homework is a continuation of `Worksheet 9`. From `Worksheet 9` we have the function $J_2 : K_2 \to \mathbb{R}$ such that for $v \in \mathbb{R}^3$,

$$J_2(v) = \frac{1}{2} v^\intercal A v - b^\intercal v,$$

where the matrix $A \in \mathbb{R}^{3\times 3}$, and the vector $b \in \mathbb{R}^3$ are defined by

$$A = \begin{pmatrix} 2 & -1 & 0 \\ -1 & 2 & -1 \\ 0 & -1 & 2 \end{pmatrix}, \quad b = \begin{pmatrix} -3 \\ 1 \\ 2 \end{pmatrix}.$$

We consider the set $K_2 = \{v = \langle v_1, v_2, v_3\rangle \in \mathbb{R}^3 | v_2 + v_3 = 0,\, v_1 \geq 0\}$. The goal is to study the problem

$$\min_{v \in K_2} J_2(v)$$

1. Using results from `Worksheet 9`, state if we can find a unique solution or not.
2. Rewrite the constrains in K_2 of the form $K_2 = \{v \in \mathbb{R}^3 | Cv \leq f\}$ with C, f to determine.
3. Write the optimal conditions to find the minimum of J_2.
4. Compute the minimum of J_2.
5. Come up with an application this problem could represent (be creative).
6. Submit your work on Catcourses under the assignment `Homework 4 (individual)` **as a .pdf**.