Exercise session 4 (SF1841) 28/11-19

① Consider

$$(QP) \quad \min_{x \in \mathbb{R}^n} \underbrace{\tfrac{1}{2} x^T H x + c^T x}_{f(x)} \quad , \quad H = \begin{pmatrix} 2 & -1 & 1 \\ -1 & 2 & 1 \\ 1 & 1 & 2 \end{pmatrix}$$

a) Do LDL^T-factorization to determine if H is positive definite.

b) In a) we found that H is positive semi-definite. For

$$c = (2 \ 2 \ 4)^T$$

determine if $-c \in \mathrm{ran}(H)$. If yes, find an expression for the optimal solutions (non-unique). If no, find a vector d such that $f(td) \to -\infty$, $t \to +\infty$.

c) Same as b) for $c = (2 \ 2 \ 0)^T$

② Consider (P) in exercise 10.10 a) on page 99 in ASKS

a) Rewrite (P) as

$$(QP_=) \quad \min \tfrac{1}{2} x^T H x + c^T x$$
$$\text{s.t.} \quad Ax = b$$

b) Solve $(QP_=)$ with the null-space method

c) Solve $(QP_=)$ with Lagrange method