1. We have the following optimization problem:

$$\begin{aligned} \underset{x}{\text{minimize}} \quad & \tfrac{1}{2}x^T P x + p^T x \\ \text{subject to} \quad & Cx = d \end{aligned} \tag{1}$$

where $P \succ 0$ (Q is positive definite), are the KKT conditions linear in the primal and dual variables?

   (a) yes
   (b) no

2. For the optimization problem shown in (1), how many Newton steps would it take to solve for the optimal primal and dual variables?

   (a) 1
   (b) 2
   (c) can't tell without more information

3. For **any** square matrix $G \in \mathbb{R}^{N \times N}$ (not guaranteed to be symmetric), is $0.5(G + G^T)$ symmetric?

   (a) yes
   (b) no

4. For a **symmetric** matrix V, does $V = 0.5(V + V^T)$?

   (a) yes
   (b) no

5. For **any** square matrix $G \in \mathbb{R}^{N \times N}$ (not guaranteed to be symmetric), does $x^T G x = x^T \left[0.5(G + G^T)\right] x$?

   (a) yes
   (b) no

6. Can any quadratic form $x^T G x$ be equivalently represented with $x^T V x$ where G **is not** a symmetric matrix, but V **is** a symmetric matrix? (everything you need to figure this out is in questions 3-5).

   (a) yes
   (b) no

7. A symmetric matrix R is positive semi-definite, with one zero eigenvalue (and a corresponding null space with dimension one). If our cost function is $J(u) = u^T R u$, is there a non-zero vector u that has a cost of 0?

   (a) yes
   (b) no