

Test 5

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February 6, 2025

- Please submit a pdf with your answers on blackboard by Thursday 13th of February at 13:00.

Use the handouts to reply to these questions. Do not use generative AI tools. Note that each answer is in the handouts.

You cannot answer using screenshots. You need to reply by typing or in your own writing. This promotes subconscious retention.

This is an individual test. You cannot collaborate with other students or any other individual. This must be your work.

You should be able to complete this in 1 page. Do not write, nor spend too much time on this.

Please state name, surname and CID.

1. Write a quadratic programme.
2. (3 points) Write a geometric programme in posynomial form. Explain why this problem is not convex. Hence, write the same problem in convex form.
3. (2 points) By varying λ in the scalarised problem, you will find different optimal points for the scalarised problem. Explain what these points are for the original convex vector optimisation problem if
 - $\lambda \succ_{K^*} 0$
 - $\lambda \not\succ_{K^*} 0$
4. (2 points) Define the conjugate function and use it to write the dual function of the problem

$$\begin{array}{ll} \min & \|x\| \\ \text{s.t.} & Ax = b. \end{array}$$

5. (2 points) Define weak duality, and strong duality. Give conditions which guarantee strong duality for a convex optimisation problem.

Non-assessed questions, for self-study - Do not submit

- Write the epigraph form of a convex optimisation problem in standard form.
- Write a linear programme.
- Define a convex vector optimisation problem. Write its scalarised version.
- Define the dual function.