

University of Macerata
Mathematical Methods for Economics and Finance

Exam Simulation C

May 04, 2023

1. Find the domain of the function $z = \sqrt{x^2 - 5xy + 4y^2}$
2. Classify the quadratic form $Q(x, y, z) = 5x^2 - y^2 + z^2 + 4xy + 6xz$.
You are encouraged to use Matlab as an additional tool to prove your results, but you are also requested to motivate your mathematical passages.
3. Find the points satisfying the first-order conditions for the following constrained optimization problem:

$$\begin{aligned} \max \quad & 3xy - x^3 \\ \text{s. t.: } \quad & x - 2y + 2 = 0 \\ & x + y \geq 3 \\ & x \geq 0 \\ & y \geq 0. \end{aligned}$$

4. Among all the parallelepipeds with volume V , determine the one whose total surface is minimum. Optional: is there a parallelepiped whose total surface is maximum?