Università Ca' Foscari di Venezia - Dipartimento di Economia - A.A.2016-2017

Mathematics (Curriculum Economics, Markets and Finance)

Mockup of Partial Examination - 2.1

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In the second partial three exercises will be set, of which one or two will be similar to those proposed in this mockup.

Consider the two variables real function, that will be used in all the exercises that follow:

$$f(x,y) = 4x^2 + y^2 - 4y + 2.$$

Exercise 1. *Find all local maximum, minimum, saddle points in the domain. Find, if existing, the maximum and minimum values.*

Exercise 2. *Find the global maximum and minimum on the constraint*

$$x^2 + y^2 = 4$$

using Lagrangian multipliers method.

Exercise 3. *Find the global maximum and minimum on the constraint*

$$x^2 + y^2 = 4$$

without the usage of Lagrangian multipliers.

Exercise 4. *Find the global maximum and minimum on the set*

$$\begin{cases} x^2 + y^2 \leq 9 \\ y \geq 0 \end{cases}.$$

Exercise 5. *Find the local maximums and minimums on the constraint*

$$x^2 - y^2 = 1$$

using Lagrangian multipliers method.
N.B. The constraint is the hyperbola plotted in the figure 1.

Exercise 6. *Find the global maximum and minimum on the constraint*

$$x^2 - y^2 = 1$$

without the usage of the Lagrangian multipliers.

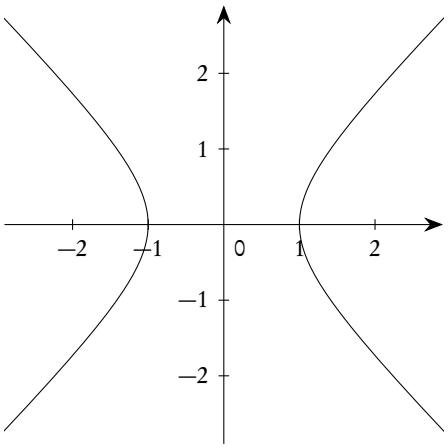

Figure 1 *The hyperbola* $x^2 - y^2 = 1$

Exercise 7. *Find the global maximum and minimum on the set*

$$\begin{cases} y \geq x^2 \\ y \leq 4 \end{cases}.$$

Exercise 8. *Find the local maximums and minimums on the constraint*

$$y = x^2$$

using Lagrangian multipliers method.

Exercise 9. *Find the global maximum and minimum on the constraint*

$$y = x^2$$

without the usage of Lagrangian multipliers.

Exercise 10. *Find the global maximum and minimum on the rectangle whose vertices are the points*

$$A = (-1,-1), \quad B = (1,-1), \quad C = (1,2), \quad D = (-1,2).$$

Exercise 11. *Find the global maximum and minimum on the triangle whose vertices are the points*

$$A = (0,0), \quad B = (4,-1), \quad C = (-1,4).$$

Other exam type questions concerning two variables real functions.

— Find and plot the domain of a given function.
— Say if the domain is open, closed, bounded, unbounded.
— Plot some level curves of a given function.