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

Mathematics 2 (Economics, Markets and Finance)

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Exercises sheet 2

Exercise 1. *Given the function*

$$f(x,y)=e^{x-y+2}$$

and the constraint $\sqrt{x-y+xy}=1$, *write the Lagrangian function and compute its partial derivatives.*

Exercise 2. *Given the function*

$$f(x,y)=\ln(x-y)$$

and the constraint $x^2-y^2=3$, *write the Lagrangian function and compute its partial derivatives.*

Exercise 3. *Maximize and minimize the function*

$$f(x,y)=x+y+1,$$

subject to $x^2+y^2=2$.

Exercise 4. *Maximize and minimize the function*

$$f(x,y)=xy,$$

subject to $x^2+y^2=4$.

Exercise 5. *Maximize and minimize the function*

$$f(x,y)=x^2-y^2,$$

subject to $x^2+y^2=1$.
Use both Lagrangian multipliers and the elementary method.

Exercise 6. *Given the function*

$$f(x,y)=(x-2)\left(y-\frac{4}{3}\right)$$

and the subset of its domain

$$A=\left\{(x,y)\in\mathbb{R}^2 \;\middle|\; 1\le x\le 3,\ 0\le y\le \frac{x^2}{3}\right\},$$

discuss whether f *has on* A *a maximum and a minimum, justifying your answer. If yes, compute them, without using Lagrangian multipliers.*

Exercise 7. *Given the function*

$$f(x,y) = x^3 - 3x^2 + 3x + y^2 - 4y,$$

a) find its local maxima and minima;
b) find its global maximum and minimum in the square whose vertices are $(0,0)$, $(4,0)$, $(4,4)$, $(0,4)$, *without the use of Lagrangian multipliers.*

Exercise 8. *Given the function*

$$f(x,y) = x + y + 1$$

find its maximum and minimum on the set

$$A = \left\{ (x,y) \in \mathbb{R}^2 \,\middle|\, x^2 + y^2 \leq 2 \right\}.$$

Exercise 9. *Compute the global maximum and minimum of*

$$f(x,y) = x^4 + y^4 - 8(x^2 + y^2)$$

in the subset of the plane given by the inequality $x^2 + y^2 \leq 9$.