Ca' Foscari University of Venice - Department of Management - A.A.2017-2018
Mathematics

First call - A - Prof. Luciano Battaia

2018/01/08

Surname:

Name:

Matriculation Number:

Legible student's signature: ______________________________

Instructions.

1. Use of programmable or graphing calculators is not allowed.
2. Exchanging information or communication with other people, as well as any other form of cheating, implies the immediate disqualification of your exam.
3. Points for correct exercise: 6 points for each exercise. You are asked to *justify* your answers.
4. Please give back *only* these sheets to the instructor: all needed calculations and explanations must be written on these sheets.

Grade (reserved to teacher)

Ex.1	
Ex.2	
Ex.3	
Ex.4	
Ex.5	

Exercise 1. *Given the real numbers a and b, consider the function* $f : \mathbb{R} \to \mathbb{R}$

$$f(x) = \begin{cases} e^{2bx}, & \text{if } x \le 0; \\ \sqrt{x+4} + x + a, & \text{if } x > 0. \end{cases}$$

a) *Find a and b so that the function is continuous and differentiable everywhere.*
b) *Find the horizontal and vertical asymptotes of f, if there are any.*
c) *Find all local maximum and minimum points of f, if there are any.*
d) *Say whether f has global maximum and/or minimum.*

Exercise 2. *Consider the function*

$$f(x) = x + 2\sqrt{x}, \quad x \geq 0.$$

a) *Find the antiderivative $F(x)$ for which $F(1) = 1$.*
b) *Find the local maximum and minimum points and the local maximum and minimum values of F.*
c) *Find $F''(x)$ and*

$$\lim_{x \to 0^+} F''(x).$$

Exercise 3. *Consider the linear system*

$$\begin{cases} x - y = 1 + k \\ kx + y = 3 \\ x + y = 1 \end{cases},$$

where k is a real number.

Check for what values of k it is consistent and, when consistent, solve it.

Exercise 4. *Consider the two variables real function*

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

Find its local maximum and minimum points.

Exercise 5. *Find the global maximum and minimum of the two variables real function*

$$f(x,y) = x + 2y$$

with the constraint

$$x^2 + 2y^2 = 1,$$

which is an ellipse in the cartesian plane (so bounded and limited).