

## 04 Exam

Students have 120 minutes and can use any literature (notes, tables, textbooks...), but no technical devices (phone, calculator, watches...).

Good luck!

### Example of the written part

1. (7 points) Find the inverse of the following matrix

$$\begin{pmatrix} 2 & 1 & 0 \\ 1 & -1 & 2 \\ -1 & -1 & 2 \end{pmatrix}$$

2. (9 points) Show that

$$(xy - 3x^2y^3)^2 = \sin(y) + 2\cos(x - y) - 2$$

determines at some neighborhood of the point  $[0, 0]$  implicitly given function with variable  $x$ . Compute the first derivative of this function at the point  $[0, 0]$ .

3. (9 points)

Find global maximum and minimum of the function  $f$  on the set  $M$ .

$$f(x, y) = x^2 + 4y^2, \quad M = \{[x, y] \in \mathbb{R}^2; x^2 + y^2 \leq 9\}.$$