

MATHEMATICAL ANALYSIS 2

Test 1, version C.

1. Find and classify the critical points of the function $f(x, y) = x^3 + 3x^2y - 6xy$.
2. Find the maximal and minimal values of the function $f(x, y) = 2x^2 + y^2$ on the domain $D = \{(x, y) : g(x, y) = x^4 + y^4 \leq 1\}$. Indicate all the points where the maximal/minimal values are obtained.
3. Performing a proper change of variables, calculate the integral

$$\iint_D (x^2 + y^2) dx dy,$$

where the domain D is bounded by the lines

$$2x^2 + 3y^2 \leq 1, \quad \sqrt{2}x + \sqrt{3}y > 0, \quad \sqrt{2}x - y > 0.$$

4. Find the area of the surface cutted from the cone $z^2 = x^2 + y^2$ by the cylinder $x^2 + y^2 \leq x$.