MATHEMATICAL ANALYSIS 2

Test 1, version B.

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1. Find and classify the critical points of the function $f(x, y) = x^3 + 3xy^2 - 6xy$.

2. Find the maximal and minimal values of the function $f(x, y) = xy^2$ on the domain $D = \{(x, y) : g(x, y) = x^2 + 2y^2 \leqslant 1\}$. Indicate all the points where the maximal/minimal values are obtained.

3. Performing a proper change of variables, calculate the integral

$$\iint_D xy\, dxdy,$$

where the domain D is bounded by the lines

$$x^2 + 3y^2 \leqslant 1, \quad x + 3y > 0, \quad x - y > 0.$$

4. Find the volume of the body bounded by the cone $z^2 = x^2 + y^2$ and the planes $x = 0, y = 0, x + y = 1$.