# MATHEMATICAL ANALYSIS 2
## Test 1, version A.

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**1.** Find and classify the critical points of the function $f(x, y) = x^3 + 3x^2y - x^2 - 9y^2$.

**2.** Find the maximal and minimal values of the function $f(x, y) = x^3 + y^3$ 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

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

**4.** Find the area of the surface cutted from the cone $z^2 = x^2 + y^2$ by the planes $x = 0, y = 0, x + y = 1$.