

## MATHEMATICAL ANALYSIS 2

### Final Test, version A.

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- (1p.)** Write the general and the directional forms of equation of the tangent plane to the graph of the function  $z = \frac{\ln x}{\sqrt{y^2 - 1}}$  at the point  $(1, 3, z_0)$ .
- (2p.)** Which points are called critical? What types of critical points there exist? Find and classify all the critical points of the function  $f(x, y) = x^2 + y^2 - 3xy + 3x + 5y$ .
- (3p.)** Write the formulae for moments of inertia for a material body  $U$  with the density function  $\gamma(x, y, z)$ . Calculate the moments of inertia of the cylinder  $U = \{(x, y, z) : |z| \leq 1, x^2 + y^2 \leq 4\}$  with the density function  $\gamma(x, y, z) = z^2$ .
- (3p.)** Write the change of variables formula in a double integral. Performing a proper change of variables, calculate

$$\iint_D (x - y)^2 \, dx \, dy, \quad D = \{(x, y) : y^2 \leq x \leq 2y^2, x^2 \leq y \leq 2y^2\}.$$

Draw the domain of integration in  $(x, y)$ - and new coordinates.