

# MATHEMATICAL ANALYSIS I

Exam, version 8.

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- 1. (2+5p.)** List five remarkable limits. Find the minimal and maximal values of the function  $f(x) = \frac{x-1}{x^2-2x+2}$  on the interval  $[0, 2]$ .
- 2. (3+4p.)** Theorem about the derivative of the inverse function: formulation, examples. Write the equation for the tangent line to the graph of the function  $f(x) = \ln(5-x^2)$  at the point  $x = -2$ .
- 3. (2+5p.)** The integration-by-parts formula for definite integral. Calculate the indefinite integral  $\int \frac{1}{x - \sqrt[3]{x}} dx$ .
- 4. (2+5p.)** Write the formulae for the area of a figure bounded by a graph and the length of the curve given by the graph. Calculate the limit  $\lim_{x \rightarrow 0} \frac{\sin x - \arcsin x}{x^3}$ .
- 5. (2+5p.)** Monotonicity and convexity: definitions, necessary and sufficient conditions in the terms of derivatives. Find the integral  $\int \frac{x+2}{x^4-3x^2+2} dx$ .