MATHEMATICAL ANALYSIS I

Exam, version 6.

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1. (2+5p.) Limit of a sequence: definition, examples. Theorem about three sequences. Find the minimal and maximal values of the function $f(x) = \dfrac{x+1}{x^2+2x+2}$ on the interval $[0, 2]$.

2. (3+4p.) Vertical asymptotes and slant/horyzontal asymptotes: definition, examples. Formulae for the coefficients of for an asymptote at $\pm\infty$. Write the equation for the tangent line to the graph of the function $f(x) = \log_2\left(x^2+4\right)$ at the point $x = -2$.

3. (2+5p.) The change of variables formula for indefinite integral. Calculate the definite integral $\displaystyle\int_0^1 x^2 10^x\, dx$.

4. (2+5p.) Write the formulae for the surface area for the bodies of revolution of the curve $y = f(x)$ w.r.t. the axis Ox and Oy. Calculate the limit $\displaystyle\lim_{x\to 0} \frac{1-\cos x + \ln\sqrt{1-x^2}}{x^4}$

5. (2+5p.) Write the Taylor formula of the order n with the residual term in the Lagrange form. Find the integral $\displaystyle\int \frac{x-2}{x^4+3x^2+2}\, dx$