LISTS OF QUESTIONS FOR THE FINAL EXAM FOR THE COURSE MATHEMATICAL ANALYSIS 1

1. Functions: definition, examples. Domain and range. Parity (even/odd).
2. Graph of a function: definition, examples. Graphs of even and odd functions. Graphs $y = f(x) + c$ and $y = f(x + c)$.
3. Injective, surjective, and bijective functions: definitions, examples.
4. Superposition of functions. Inverse function (Definitions, examples).
5. Limit of a sequence: definition, examples. The theorem on arithmetic operations with limits of sequences.
6. Theorem about three sequences.
7. Monotone sequences, bounded sequences. The Boltzano-Weierstrass theorem.
8. The definition of the Euler number e.
9. Five remarkable limits.
10. Infinite limits: definition, examples.
11. Limit of a function at a point: definition, examples. The theorem on arithmetic operations with limits of functions.
12. One-sided and infinite limits of a function at a point. Limits of a function at $\pm\infty$.
13. Continuous functions: definition, examples.
14. Properties of a function, continuous on a segment.
15. Vertical asymptotes and slant/horyzontal asymptotes: definition, examples. Formulae for the coefficients of for an asymptote at $\pm\infty$.
16. Derivative of a function: definition, examples. The tangent line to the graph of a function.
17. The derivatives of $f \pm g$, fg, f/g.
18. Theorem about the derivative of a composition of functions (the chain rule): formulation, examples.
19. Theorem about the derivative of the inverse function: formulation, examples.
20. The extrema: local and global, the algorithm of finding the extrema at a segment.
21. Monotonicity and convexity: definitions, necessary and sufficient conditions in the terms of derivatives.
22. The Lagrange mean value theorem.
23. The Taylor expansion.
24. The primitive (antiderivative) of a function, the indefinite integral of a function: definition, examples.
25. Elementary properties of indefinite integral. The integration-by-parts formula.
26. The change of variables formula for indefinite integral.
27. The algorithm of integration of rational functions.

28. Integration of trigonometric expressions.
29. Definite integral: definition, the Newton-Leibnitz formula.
30. Formulae for the area of a figure bounded by a graph an the length of the curve given by the graph.
31. Formulae for the volume and the surface area for the body of rotation.