LISTS OF QUESTIONS FOR THE FINAL EXAM FOR THE COURSE MATHEMATICAL ANALYSIS 1 (MAT 1653)

1. Logic sentences and quantifiers. Conjunction, disjunction, and implication. De Morgan's rules.

2. Functions: definition, examples. Domain and range. Parity (even/odd).

3. Graph of a function: definition, examples. Graphs of even and od functions. Graphs $y = f(x) + c$ and $y = f(x + c)$.

4. Injective, surjective, and bijective functions: definitions, examples.

5. Superposition of functions. Inverse function (Definitions, examples).

6. Limit of a sequence: definition, examples. The theorem on arithmetic operations with limits of sequences.

7. Theorem about three sequences.

8. Monotone sequences, bounded sequences. The Boltzano-Weierstrass theorem.

9. The definition of the Euler number.

10. Five remarkable limits.

11. Infinite limits: definition, examples.

12. Limit of a function at a point: definition, examples. The theorem on arithmetic operations with limits of functions.

13. One-sided and infinite limits of a function at a point. Limits of a function at $\pm\infty$.

14. Continuous functions: definition, examples.

15. Properties of a function continuous on a segment.

16. Vertical asymptotes and asymptotes at $\pm\infty$: definition, examples. Formulae for the coefficients of for an asymptote at $\pm\infty$.

17. Derivative of a function: definition, examples. The tangent line to the graph of a function.

18. The derivatives of $f \pm g$, fg, f/g.

19. Theorem about the derivative of a composition of functions (chain rule): formulation, examples.

20. Theorem about the derivative of the inverse function: formulation, examples.

21. The extrema: local and global, the algorithm of finding the extrema at a segment.

22. Monotonicity and convexity: definitions, necessary and sucfficient conditions in the terms of derivatives.

23. The Lagrange's mean value theorem.

24. The Taylor expansion.

25. The primitive (antiderivative) of a function, the indeterminate integral of a function: definition, examples.

26. Elementary properties of indefinite integral. The integration-by-parts formula.

27. The change of variables formula for indefinite integral.

28. The algorithm of integration of rational functions.

29. Integration of trigonometric expressions.

30. Definite integral: definition, the Newton-Leibnitz formula.

31. Formulae for the area of a figure bounded by a graph an the length of the curve given by the graph.

32. Formulae for the volume and the surface area for the body of rotation.