

Mathematics A3 SYLLABUS (2017/2018 first semester)

Topic I. Differential equations:

1. Classification and application of differential equations. Separable equations. Homogeneous (in the variable) equations. The existence and uniqueness theorem for first order equations.
2. First order linear differential equations. Autonomous equations, stability. Exact equations.
3. Special types of nonlinear second order equations (missing terms). Second order linear equations. Homogeneous equations: fundamental solutions, linear independence and Wronskian. Inhomogeneous equations: Variation of Parameters Method.
4. Second order linear equations with constant coefficients. Inhomogeneous equation: Method of Undetermined Coefficients.
5. Applications, e.g., oscillations. Systems of linear differential equations.
6. Summary for the midterm.

Topic II. Probability theory:

7. Combinatorial analysis. Permutations, variations, combinations.
8. Axioms of probability. Sample space and events. Sample spaces having equally likely outcomes.
9. Conditional probability and independence. Bayes' Formula.
10. Random variables. Distribution functions, expectation, and variance. Independence and joint distribution of random variables.
11. Discrete random variables: Bernoulli, Binomial, Geometric, Negative Binomial (Pascal), Hypergeometric, Zeta (Zipf) distributions.
12. Absolutely continuous random variables: Uniform, Exponential, Normal (Gaussian) and Gamma distributions. Density and distribution functions.
13. Chebysev's inequality and the weak law of large numbers. The Central Limit Theorem, Moivre–Laplace Theorem.
14. Linear regression, basic statistics.

Literature:

- I. W. E. Boyce, R. C. DiPrima: Elementary Differential Equations, Wiley, 1992.
- II. S. Ross: A First Course in Probability, Prentice-Hall, 1992. (.../ceu)
- III. B. Barabás: Differential Equations (Note, Budafoki u. 13.)

Schedule of midterm tests:, in the practice class. Make up test: in December (not in the class): any of the midterms can be repeated.

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