

## ON TEACHING OF MATHEMATICS IN TECHNICAL UNIVERSITIES

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A century of computers has come and an unbelievable range of opportunities were brought to us. Thus almost 90% of exercises, which formed the base of mathematical education for more than a century (limits, differentiation, integration, multi-variables functions, series etc) can be solved by pushing only several keys on the keyboard . . . No one can ignore these changes.

A group of professors of mathematics of different universities has decided to join their efforts in creating a multifaceted manual of mathematics, which would meet all the requirements of the new computer century in all its aspects — methods of teaching with the aim of rousing students in studying mathematics and control of quality education.

An important characteristic of our work is its validity. We try to motivate each step we make, such as the general planning, the planning of each lecture, material selection and so on.

Each Lecture comprises the following components: 1) an epigraph, 2) a summary, 3) a basic part, 4) discussions, 5) graphics, 6) an historical excursus, 7) portraits, 8) a cycle of problems (a quiz, exercises, tests, problems for personal solving), 9) a computer based comment, 10) a list of literature. The main definitions are considered from three points of view — analytical, geometrical and from the point of view of natural sciences. They are also followed by expressive computer-based illustrations.

The electronic version of our manual is using all the possibilities of modern computer-based educational technologies, such as branched hyper-text structure, sound and video fragments, interactive elements and controlled animation. In the whole range electronic manuals for technical universities we know we can see only limited of such possibilities. An interesting variant of interactive course of mathematical analysis in English is being working out by Bert G. Wachsmuth (<http://www.shu.edu/projects/reals/>).

Original computer methods of problem solving (for example, applied to extremums-finding cases), supplementing traditional geometrical and analytical methods will be presented in our manual. Such an approach is extremely visual (the animation directly shows the answer and the process of solving), and it introduces methods of mathematical modeling to the students using materials that are well-known to them. Thus, future engineers get acquainted not only with the basics of the university course of mathematics, but they are also taught to use mathematics as a research technique.

The multi-level structure of presenting the material provided with the system of hyperlinks gives the student an opportunity to choose the level that meets his interests and goals of studying. In the upper layer are presented basic materials on each topic of “High-mathematics course for engineers” that almost all the authors of teaching programs of the course consider necessary to go through.

The main directions of more specified consideration are the following:

- proofs of theorems and affirmations, supplementing the basic text;
- answers for quizzes hints for problems and exercise from the main text computer animations hyper-active diagrams and table, accompanied by vocal comments problems and exercises of higher complexity discussions and historical excursus.

Testing as a form of final control will be used at different stages of educational process — for interim control as well as for controlling the results of the education.

We hope that our manual will be used in the system of distant education in Russia.

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