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M.E. ISIN, A.B. NAYMANOVA, M.A. UAIKHANOVA
ABOUT INTERRELATION OF COURSES
OF THE MATHEMATICAL ANALYSIS
AND MATHEMATICS TEACHING METHOD

Modernization of school mathematical education has demanded improvement of the whole system of training the mathematics tutors at pedagogical universities, in particular, of change of training programs for mathematical and methodical disciplines. With introduction at schools into the mathematics course of the beginnings of mathematical analysis the content and purposes of the course of mathematical analysis have changed at the Faculties of Physics and Mathematics of pedagogical universities. The mathematical analysis from general educational one has turned into the special discipline, which has a significant value in training mathematics teachers for practical activity at schools. The sections of the mathematical analysis studied at the first year at the Faculties of Physics and Mathematics of pedagogical universities, generally serve for training students for future teaching of the beginnings of the analysis at school. Therefore, methodical tasks should be put before a course of the mathematical analysis. The course should start with the beginnings of the analysis, studied at school, show inevitable gaps in creation of the beginnings of the analysis at 10-11 grades of comprehensive schools, plan and realize ways of elimination of these gaps, form students' profound knowledge of concepts of a mathematics school course, skills in using methods of the beginnings of the analysis. Such change of the value and role of the course of the mathematical analysis has caused alteration in training technique of the analysis and first of all establishes at the Faculties of Physics and Mathematics of pedagogical universities closer relation between the method of teaching mathematics and mathematical analysis. Thus, it is necessary to start with the following general provisions.

1. The course of the mathematical analysis precedes the course of the method of teaching mathematics and, consequently, is urged to prepare the mathematical base for studying technique of teaching mathematics, particular, a technique of teaching algebra for 9-year school, algebra and the analysis beginnings for 10-11 grades in comprehensive schools.

2. Training method of teaching mathematics should be made, proceeding from mathematical bases of a school course of the mathematics, acquired by students during studying the mathematical analysis. It should be noted, that the mathematical analysis is a mathematical basis and for some other sections of a school course of mathematics. For example, as a basis for studying the length, areas and capacity the theory of measure and integrated methods of calculation of these values serves in a school course of mathematics, studied in a course of the mathematical analysis. Therefore, in a course

of method of teaching mathematics knowledge and skills, acquired by students during 1-2 courses of studying the mathematical analysis should be used.

3. It is useful to implement a common approach to study concepts, general for a school course of mathematics and a course of the mathematical analysis not to get different interpretations and various treatments of the same concept of school and high school courses of the mathematical analysis and a method of teaching mathematics. So, if in a school course of mathematics to consider functions as mapping, and when studying the mathematical analysis at pedagogical universities such approach to introduction of concept of function is desirable. And at lectures and classes on the method of teaching mathematics it is necessary to train a technique of formation of concept of mapping and its particular form – numerical function. At such unanimity of views on treatment of the “function” concept an intending teacher will receive sufficient training for teaching doctrine about function at school.

4. The continuity should be observed also during studying methods of the solution of tasks. The methods of the analysis, studied at school, should be developed in details and grounded during training the mathematical analysis at institute. The problem of the method of teaching mathematics is to study a technique of formation of pupils' skills in mastering the methods of the beginnings of the analysis. So, the solution of tasks in searching for extremum, as well as the largest and least values of function in high school is carried out with using of derivative. In the course of the mathematical analysis this method has sufficient justification and further development. During studying a technique of teaching mathematics students master a technique of pupils' formation of abilities to do sums in extremum, find the largest and least values of function.

Implementation of these general provisions can be carried out both while vocational pedagogical guidance of the mathematical analysis (such sections of the course as introduction to the analysis, differential and integrated calculus and others which elements are studied in high school), and teaching the technique of teaching mathematics with the help of students' knowledge, obtained in the course of the mathematical analysis. Vocational guidance of the course of the mathematical analysis can be carried out in the following directions. In the content of the mathematical analysis course itself professional orientation should be clearly noticeable. It should be noted, that besides the general mathematical education, the mathematical analysis is urged to promote training highly skilled mathematics teacher in every possible way.

Achievements of these purposes can be executed by the following ways:

1. Detailed consideration and the proof of offers, formulated, but not proved in the analysis beginnings. These are sufficient conditions of existing of an extremum of function in a point, the theorem of existence of limit of monotonous limited sequence, feature of a certain integral and etc.

2. The introduction and study various definitions of elementary functions (indicative, power, logarithmic, trigonometrical, regressive trigonometrical, etc.). Exponent can be easily defined in different ways:

$$1) e^x = \lim_{n \rightarrow \infty} \left(1 + \frac{x}{n} \right)^n$$

$$2) e^x = \sum_{n=0}^{\infty} \frac{x^n}{n!}$$

The specified definitions would be more useful for introducing to students at various stages of students' mathematical education so that students repeatedly address to elementary functions during studying the mathematical analysis.

3. The equivalence establishment of the concept definitions, formulated in school textbooks in the beginnings of the analysis, with distinct from them definitions of the same concepts, offered in the course of the mathematical analysis of a pedagogical institute, is possible to prove, for example, that for continuous functions a school determination of integral through the increment of primitive is equivalent to a determination of integral through a limit of the integrated sums.

4. Display of inevitable gaps of a school course of the beginnings of the analysis and ways of their elimination. It should be noted that the most serious gap of the school course is caused by absence in it any theory of real numbers. With creation of such theory in the course of the mathematical analysis this gap will be liquidated. Gaps in the «Primitive and integral» section of the «Algebra and the analysis beginnings in the 11th grade» teaching aid are especially essential. The proof of existence of primitive, feature of a certain integral, study the classes of integrated functions should meet these lacks.

The problem of vocational training the teacher of mathematics should be resolved and also by a choice of a technique of teaching the mathematical analysis at pedagogical universities, namely:

1. At lectures on the mathematical analysis the correct methodical comments of the lecturer can bring a big advantage. Types of such comments can be various:

a) it is possible to consider options of a statement of some questions of the beginnings of the analysis at school, for example, an option of introduction of the concept derivative of tasks about speed, tangent;

b) it is possible to offer methodical councils in studying some concepts of the mathematical analysis at school, for example about use of geometrical illustrations during studying a limit of function in a point;

c) it is desirable to explain, why these or those sections and suggestions of the mathematical analysis are not studied or studied optionally at school and are given without the proof. So, sufficient conditions of monotony, existence of function extremums are not proved in the school course as the corresponding proves are based on the theorem of Lagrange of final increments or Taylor's formula, whose consideration would require more expenditures of time and students' skills.

2. Options of a statement of separate questions of the analysis beginnings at school sometimes are useful to consider during practical classes studying appropriate sections of the mathematical analysis. Thus, students compare a school option with studied in the mathematical analysis. So, the theoretical questions, necessary for the solution of tasks and carrying out of exercises in the mathematical analysis, are better to learn.

3. Into the system of sums and exercises in the course of the mathematical analysis it would be necessary to include some tasks and exercises of intense difficulty from school textbooks in algebra and the beginnings of the analysis and other teaching aids. Such sums are either solved during practical classes according to the mathematical analysis, or recommended to students for independent doing. Thus, students receive some training for practical work of the mathematics teacher at lessons or at out-of-school activities, get acquainted with additional literature in the beginnings of the analysis which can be used further in the pedagogical activity.

4. During studying some sections of the mathematical analysis it is useful to suggest students to revise appropriate sections of school textbooks «Algebra and the analysis beginnings» for 9-11 grades. It allows first-year students to look at studying at school of the beginning of the analysis. It is thus established, that in the course of the mathematical analysis development and generalization of ideas is executed, with which acquaintance partly began in the school course of mathematics, new approaches for studying concepts of the mathematical analysis are being observed, the first acquaintance with which took place already during studying mathematics at school.

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М.Е. ИСИН, М.А. УАЙХАНОВА, А.Б. НАЙМАНОВА
МАТЕМАТИКАЛЫҚ ТАЛДАУ ЖӘНЕ МАТЕМАТИКАНЫ ОҚЫТУ
ӘДІСТЕМЕСІ КУРСТАРЫНЫҢ ӨЗАРА БАЙЛАНЫСТАРЫ ТУРАЛЫ
М.Е. ИСИН, М.А. УАЙХАНОВА, А.Б. НАЙМАНОВА
О ВЗАИМОСВЯЗИ КУРСОВ МАТЕМАТИЧЕСКОГО АНАЛИЗА И
МЕТОДИКИ ПРЕПОДАВАНИЯ МАТЕМАТИКИ

Түйіндеме

Бұл мақалада педагогикалық институттардағы математикалық талдау және математиканы оқыту әдістемесі курстарының өзара байланыстары қарастырылады.

Резюме

В данной статье рассматривается взаимосвязь курсов математического анализа и методики преподавания математики в педагогическом институте.