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Designing Adaptive Online Mathematics Course Based on Individualization Learning

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Abstract: The article provides a possible option of how first-year students of Russian universities adapt to mastering higher mathematics. The purpose of the research is the development of methodological approaches to designing an online course that recaps school math material in a short period. The concept of individualization of educational activities is used as the main design method. Online training is used as the implementation technology. The article provides an overview of scientific papers on the use of an individual approach to learning and online resources in teaching mathematics. The social survey of first-year students confirmed the relevance of the stated purpose. The authors describe the design methodologies of the online training by taking into account age, social and psychological characteristics of students, and the opportunity for developing individual educational trajectories. The authors set the objectives of the course and structuralize each topic. Instructional content is developed in accordance with step-by-step leveling on mastering educational material. Extra attention is given toward presenting educational information in ways that take into account different types of cognitive processes. Foreign students who receive education in Russian universities are also welcomed to the online course to get familiar with the mathematical terminology in the Russian language.

Keywords: individualization learning; online training; adaptive math course

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1. Introduction

Along with technical progress and digitalization, with the fast growth of the information volumes, higher education is subjected to having its tasks changed or modified. Today's level and scope of education is no longer enough to provide students with up-to-date knowledge and skills. Moreover, the formation of professional knowledge, developing student's abilities for self-realization, as well as readiness for lifelong learning and for consistent development appears to be more important than ever.

In today's rapidly changing world, professional skills require constant improvement. Only those professionals who do not stop developing and widening their horizons are in demand in the job market. So that a graduate student could possess such qualities, it is necessary to ensure their active involvement in the educational process starting from the very first year.

According to the authors' practical experience and the research under review, most first year undergraduate students of the Financial University under the Government of the Russian Federation consider the task to become qualified professionals their number one priority. They are eager to start studying, but the arising difficulties can become showstoppers: students lose interest in learning and get discouraging results. It is an open secret that, at any university, there are students who neglect educational activities and do not progress, but these are not accounted for in this research due to their minority.

We will try to find reasons why yesterday's high school graduate with high grades, who is eager to study, fails at university and loses interest in learning. This problem is especially acute at the beginning of studying the course of mathematics, which is important among students of economics and finance. On the one hand, this can hardly be overestimated, but, on the other hand, it is rated as one of the most difficult academic disciplines for students. According to the authors, the main difficulty of first-year students is that they have a different level of mathematics training. This can be explained by the following reasons:

- despite the fact that applicants enter a university from different regions of the country but take the unified state exam, it does not exclude different approaches in teaching mathematics, or in setting priorities and requirements when studying a school course.
- students who entered a university on a fee-paid basis or in a targeted training may have lower skills than those who got a state-commissioned study place.
- students who entered a university after graduating from college, often have a gap of several years in learning mathematics, and, due to that, they face even more difficulties in learning higher mathematics.
- students from other countries may face language barrier problems: both the knowledge of the language itself, and the differences in subject terminology.

Thus, there is *a basic contradiction* between the different level of mathematical training of first-year students and standard requirements for mastering the course of mathematics.

There is a discouraging contradiction between the need to study the new material according to the curriculum, which is rather pressed for time, and an instructor's reasonable desire to devote training time for revision, develop a common terminological base, and focuse on important topics of elementary mathematics.

The analysis of the situation allowed us to advance a hypothesis that, in order to resolve these contradictions, it is necessary to offer students a comprehensive intensive course that would cover material from the school course of mathematics to successfully mastering higher mathematics. This course cannot shift the timeframe of the basic mathematics in the educational program schedule. That is why it must be mastered in parallel, and within a short time. The extensive development and popularity of online education and the interest it raises in the young led the authors to the idea that this course can be most effective online.

The *object* of the study was the process of adapting the students enrolled in the first year of the university to the study of the disciplines of higher mathematics. The subject of the research is a special resource, the development of which could eliminate the revealed contradiction between the uneven level of the first-year students' initial level of mathematical training and the uniform requirements for the programs of mathematical disciplines.

The *purpose* of the current research is to develop methodological approaches for designing a systematic online course that briefly revises the material of the school mathematics course, which allows adapting students of different levels of preparation toward mastering higher mathematics successfully. The online course should be developed based on the individualized educational concept, which takes into account age, social, psychological characteristics of students, and the opportunity to develop the individual educational trajectories.

The study used an *aspect approach*. The most important aspects highlighted by the authors were: the aspect of *the learning process individualization* and *the social and humanistic aspect* associated with it.

The aspect of individualization was considered by level differentiation and differentiation associated with the features of the learning process.

The social-humanistic aspect was considered in the context of taking into account the characteristics of students from different social groups. In conducting the study, the authors used general scientific methods, an analysis of the literature on the problem under study, and formal-logical (analysis and synthesis) and sociological factors (observation, study of students' works, questioning).

To achieve this objective, we set the following tasks:

1. to study the psychological and pedagogical literature through the individualized learning process;
2. to study modern concepts of online education and development of online training;
3. to carry out a survey of first-year students on the need for such a course and ways of its implementation;
4. to draw a map of expected results from learning;
5. to select the materials for the training course that best meets the goal;
6. to develop a course scenario by taking into account the opportunity of the individual educational trajectory;
7. to provide students with educational resources. this would be convenient and engage different types of perception;
8. to select educational content for foreign students with the opportunity to practice language and provide college graduate students with training materials.

2. Literature Review

2.1. Experience of Online Education in Russia

The main thing when working with literature was to study the possibilities of designing online courses in mathematics in accordance with the ideas found in the introduction.

The literature can be divided into the following sections:

- research that studies the technology of individualization of training;
- studies considering methods of creating individual educational trajectories in online courses;
- studies in which the aspect of individualization is considered in the context of peculiarities of mental processes;
- studies investigating the social and humanistic component of online education;
- studies considering the technological features of creation and implementation of online courses.

The structure, forms, and methods of any educational process are usually designed for the "average" student, whose level of knowledge allows him to understand and master new information. The content of the subject, set out in the work program, which corresponds to the Educational Standard, implies that the student knows basic terminology and is able to successfully perceive new knowledge. However, the individual time spent on mastering certain educational information may not coincide with the "average" time allotted by the official schedule. Individualization of education technology is the main goal to overcome this contradiction [1].

Variability becomes one of the fundamental principles of modern education. It allows individualizing the learning process by developing individual educational trajectories. The educational trajectory covers not only a certain set of basic and variable subjects, but also the opportunity to choose the style and teaching methods.

The term "individual educational trajectory" came to Russian pedagogy more than 20 years ago. It was introduced by I.S. Yakimanskaya as an individual development trajectory in the framework of the theory of student-centered education [2]. I.S. Yakimanskaya links this term with the mechanisms of self-organization and self-fulfillment of an individual, while the content of the learning process and its forms are focused on the students' personal characteristics.

The idea of individual educational trajectories gained considerable development in the works of A.V. Khutorskoy on the heuristic learning technology. A.V. Khutorskoy treats the concept of an individual educational trajectory as a program developed together with a teacher on "personal educational activity program, which reflects his/her understanding of the goals and values of society, education, in general, and his own, the focus of educational interests and the need to combine them with the needs of society, the results of free choice of content and forms of education, corresponding to his individual style of teaching" [3]. Thus, when developing an individual educational trajectory, it should not only include opportunities to select educational resources, but also to choose the style of learning, appropriate pace, diagnosis, and assessment of results.

The "Encyclopedia of Educational Technologies" by G.K. Selevko [1] defines the individualized learning technology as an organization of the educational process, in which the individual approach and the individual model of interaction between the teacher and the student take a prior position. This kind of training involves the design of educational activities based on the individual qualities of the child (his/her interests, needs, abilities, mental power, etc.). Following the idea of A.V. Khutorskoy on the diagnosis of a student to develop a student-centered learning trajectory, G.K. Selevko [1] suggests identifying what type the student belongs to. Below, we provide a list of the types of students that are relevant for our research:

- by perception of information: visual (mostly perceives visually), audial (perceives mainly by ear, "verbally"), and tactile (perceives mainly through movement and touch);
- by speed of perceiving information: high-speed and slow-acting;
- by depth, quality, and level of perceiving information: students who perceive a lot of information, but not that deep and quickly forget it, those who perceive one thing really effectively and remember it once and for all;
- by motivation to learning: those who are interested in learning, school as a whole, mastering new things, etc., those who are indifferent, actively not willing to learn;
- by abilities to an academic subject: gifted, capable, average-skilled, and incapable.

A significant number of studies is devoted to the psychological aspects of developing individual educational trajectories. Therefore, for instance, A.L. Pligin [4] associates the development of trajectories with the type of thinking and the perception strategy. The author considers individualizing the learning process as a means for organizing student-centered learning.

The problems for developing individual educational trajectories in higher education are investigated in the doctoral dissertation of E.G. Erykova. [5]. She understands an individual educational trajectory as a "student-centered organization based on the FSES and education curriculum, ensuring the formation of his/her individual style of self-education activities and the gradual mastering of key competences in the training process".

In research [6], the authors propose to formalize the model of information flows in order to select the optimal variant of network interaction in the formation of individual educational trajectories.

The article [7] is also devoted to the implementation of educational variability and the development of individual educational technologies, in which the authors share their experience in carrying out such work in teaching mathematics within the bachelors in "Applied Mathematics and Computer Science" at the Financial University.

One of the perspective forms to realize individualization of the learning process is adaptive learning. In this regard, we would like to highlight the study [8]. The author I.A. Krechetov is the developer of users' interfaces for remote control systems training, including the systems with adaptive learning technology.

The experience of introducing online courses into the educational process and the problems of the educational quality on the use of mixed learning is presented in paper [9]. Modern methods of teaching particular disciplines with the use of online courses are considered in paper [10]. They contribute to the self-study of the most important topics by students and the assessment of the knowledge gained.

2.2. Online Education Experience in Other Countries

Many foreign researchers in pedagogical science are engaged with problems of learning and individual differences. Their research is based on a deep study of the relationship between personality traits and academic achievement.

Problems associated with the development and implementation of individual educational trajectories are the subject of investigation in a great number of scientific and methodological research studies.

The relationship of personality traits and academic achievement, while controlling for cognitive ability, are the subject of the research of Meyera J., Fleckensteina J., Retelsdorfc J., and Köllera O. [11].

In their study, authors focused on the personality as specific personal traits. They have developed the five-factor model (as the most productive) to classify the structure of human personality (extraversion, agreeableness, conscientiousness, neuroticism, and open-mindedness).

Researchers consider two domains (mathematics and English as a foreign language) using both grades and standardized test scores. They concluded that personality, intelligence, and academic achievement are interconnected and need to be considered simultaneously.

Conscientiousness is even more valuable in mathematics because persistent learning behavior and analytical thinking are essential qualities for learning mathematics.

However, if open-mindedness is overabundant, it might not be useful for learning mathematics [12]. In contrast, those jobs that include rewards for critical thinking and creative ideas are correlated more strongly with open-mindedness [13]. Open-mindedness is extremely important for curious students, interested in cognitive activities that demand free-time [14], such as reading books or watching movies in foreign languages, and cultural activities.

Many researchers in the field of online education raise serious questions about improving the effectiveness of online courses (based on the results of analytics). For instance, the question regarding teacher's being present in the frame or beyond the frame.

The presence of the teacher in the frame creates obstacles for some students and distracts them. Therefore, the researchers recommend creating and using two versions of the video: one that shows the teacher in the frame and the second one where the teacher is out of the frame [15,16].

The question where the subtitles are to be placed is also very important. If subtitles are put inside the video, they may distort the perception of the material, as the text may overlap the image. Therefore, experts recommend placing subtitles to the right of the video window [17].

The most important component of the online courses is testing. It is important to determine students' progress on a course. Many authors are advised to embed tests in the video. Built-in video tests promote student learning [17]. Coursera advises them to embed one task every 3 minutes of a video.

Long videos have low effectiveness, since they are tiring and risk students to stop watching them [18]. As a rule, experts suggest to divide videos into short fragments, up to 10 minutes each.

A number of functions can be useful in teaching students: changing video speed [17,18], resizing images, rolling back, or forth and pausing.

If you add more information to the description such as rating, time spent on doing tasks, statistics of activity on the forum [19], it will increase students' interest in the course.

Visualizing textual information with diagrams and/or animations, as well as using examples and case studies, will greatly increase the level of learning [20].

Instant messaging is also important. To increase student engagement, it is recommended to add an instant messaging capability [20].

The creators of online courses always solve the problem of increasing students' interest in the course. The researchers [21,22] note that the use of quizzes and other games significantly increases students' interest in the course.

The video lecture format and solving tasks can be ineffective. Therefore, it is necessary to build a course around the project, where all tasks are components of a single super-task. This approach will increase students' interest [23].

Researchers [24] note that the ability to answer the questions increases student achievement and it is more likely that he/she will complete the course. The most effective is the combination of automated assessment, mutual assessment, and self-assessment. Students appreciate the tests because they provide instant feedback.

The mutual assessment allows us to not only get feedback from other students, but also to learn from the work of others.

Self-assessment is the mildest form of assessment, as it reduces the negative feelings associated with the assessment situation [25].

A machine-learning framework was then designed to infer both the demographic and psychological attributes from the behavioral data.

These interesting and important results call for further investigation, since they are still far from being able to unveil individuals' psychological state.

The problem of cyber security in free online courses is very important. When preparing online courses, the designer has to decide what to teach and how to do it. In the investigation "Design recommendations for online cybersecurity courses" [26], authors are provided with a set of recommendations for both cases.

The demand for cyber security professionals is increasing and many courses have been developed to address this issue. This paper [26] presents an analysis of 35 cyber security online courses concerning the NICE (National Initiative Cybersecurity Education) framework.

Due to the rapid development of online education, there start appearing the so-called "professionals" who are not teachers, but who wish to enter the online education field as instructors and teach the subject. The problems of preparing the potential online instructors who can successfully teach their students is the subject of investigation of The Art of Teaching Online: How to Start and How to Succeed as an Online Instructor.

To MOOC or not to MOOC [27] explores the history of Massive Open Online Courses and analyzes the current MOOC context. Authors suggest ideas about the future of MOOC and describe possible trends that may impact higher education, such as business models, data and analytics, learning design, and competitors in the MOOC marketplace.

The virtual learning environment (VLE) or learning management system (LMS), which is one of the most widely used, is described in the book called "Online learning and its Users: Lessons for Higher Education" [28]. The book presents an activity theoretic analysis of the VLE's adoption. It is noted that we can answer the questions by heeding the lessons from previous experiences with the VLE and early iterations of the MOOC.

Technology in high education and the Internet, designing global online programs and courses, global online teaching and learning are the subject of research of many authors [29].

There are a lot of opportunities in online education as well as a lot of problems related to MOOC and Open educational resources (OER) that should be discussed. However, it is clear that it is necessary to continue the work that has already begun and solve the problems gradually.

The priority project "Modern digital educational environment in the Russian Federation," approved by the Government of the Russian Federation in October 2016 [30], is aimed at incorporating digital tools for learning activities and integrating them into the information environment in order to provide individual lifelong learning "anytime and anywhere." The main idea of the project is to provide access to online courses (MOOC), developed and implemented by different organizations on different online training platforms, to individuals and educational organizations of all education levels.

The digital educational environment portal has access to 37 platforms including one that is the Open online academy of the Financial University. This is a network educational project in the field of e-learning, which provides open access to the author's courses of the best university teachers, student educational projects, and other educational materials. Experienced teachers of the Financial University who have knowledge of the subject and teaching methods attend the development of online courses. Since February 2017, the resource started running in a test mode, and, in August 2018, the best-tested courses were added on the portal of the digital educational environment, including "Organization and economics of small business," "Logic: Theory of reasoning", "Intercultural business communication", and "Behavioral finances".

3. Materials and Methods

3.1. Observation

For more than 15 years, the authors of the study teach higher mathematics to the first-year bachelor students of the Financial University under the Government of the Russian Federation, studying the areas of "Economics" and "Management." Observation of freshmen from the first steps of study at the University allowed us to come to the conclusion that some of them need to revise the material of school mathematics. They have problems with identical transformations of algebraic expressions (especially logarithmic and trigonometric expressions), analysis of graphs of functions, using the reduced multiplication formulas, etc.

3.2. Monitoring Learning Achievement and Error Analysis

Problems associated with gaps in knowledge of school mathematics are clearly reflected in students' papers. Checking the students' papers often shows them mastering the new material, but errors in using the topics of school mathematics. Students make mistakes in identical transformations, solving equations, and inequalities.

Particular attention is paid to computational errors. The article of the authors of the online course [31] is devoted to the insufficient level of computing skills of school graduates. The analysis of students' papers allowed us to come to a conclusion that 44% of errors in students' papers are of computational character. Among them are incorrect operations with fractions and decimals, negative numbers, and brackets.

From 2012 to 2015, teachers of the Mathematics Department of the Financial University conducted diagnostic testing of first-year students. The purpose of the test was to determine the real level of knowledge of school mathematics. Brief results of the study are presented in Reference [32]. It can be seen that the graphs of the distribution of estimates are the same for all years of testing. The average percentage of test execution varies from 35% to 38.1%.

The points received in 2015 for completing tasks on some topics (in the percentage) are displayed in Table 1. A total of 2483 first-year students took part in the testing.

Table 1. The results of the diagnostic testing (selected topics).

Subject	Average Percentage of Students Who Completed a Task
Task containing percentages	66
Algebraic equations	24
Exponential (or logarithmic) equation	38
Inequality	35
Tasks with a parameter	9
Geometrical problem	38

A stable distribution of results and a fairly low percentage of solving the basic tasks confirms the necessity to create a course for the systematic repetition of school mathematics.

3.3. Sociological Survey of Students

To study the students' opinions about the need to revise the school mathematics course, a survey was carried out for first-year bachelor students of the Financial University, studying in the areas of "Economics" and "Management" (https://docs.google.com/spreadsheets/d/1a2QWfXfyDJuiIi_FOSG6140SmVCza93O8Eur3kAG1Ak/edit?usp=sharing).

The authors of the online course developed questions to determine:

- necessity for repetition of school mathematics,
- preferable form of organizing the repetition,
- and structural organization of repetition.

A total number of respondents in the survey was 621.

Figures 1–5 present the questionnaire questions and the distribution of students' answers.

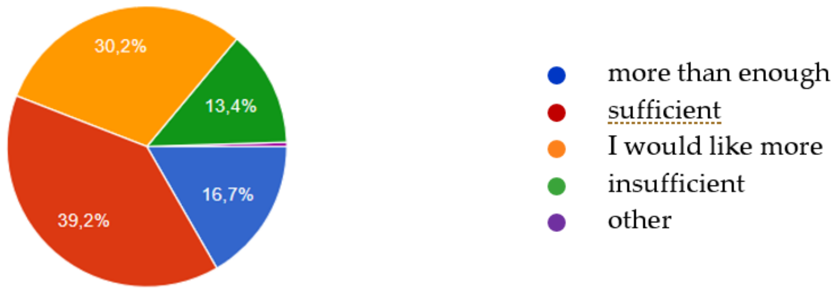

Figure 1. Is the level of your mathematical training sufficient to study at the University?

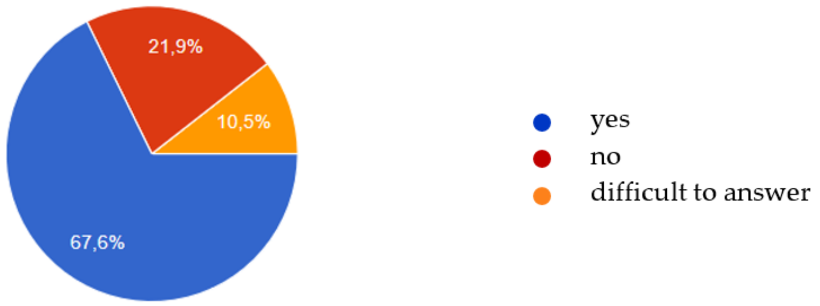

Figure 2. Do you think it would be useful to repeat briefly the school mathematics course at the beginning of the first semester?

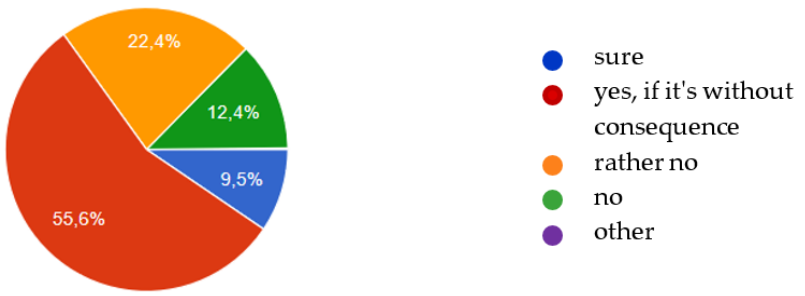

Figure 3. Would you like to pass a diagnostic test to verify your knowledge at the beginning of training?

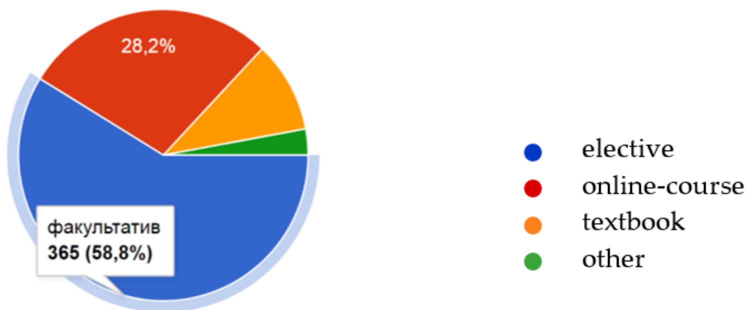

Figure 4. What forms of revising the school mathematics do you prefer?

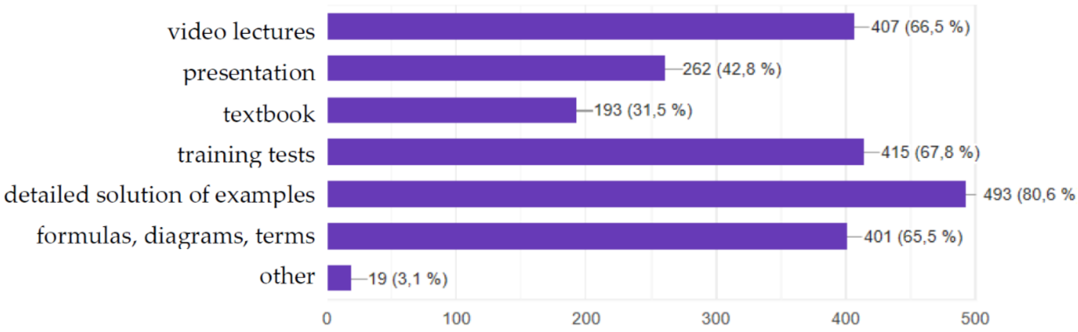

Figure 5. If the repetition is organized in the form of the online-course, choose the necessary items from the list.

Analyzing the results of the survey, we note that the majority of students (46.9% of respondents) who finished the first year of university feel the need to revise the school mathematics course (Figure 1). 67.6% of respondents consider this important and necessary (Figure 2). In general, 65.1% of respondents would like to pass a diagnostic test (Figure 3).

More than half of the respondents (58.8%) would like to revise school mathematics during extra classes, i.e. in the mode of fast verbal feedback, discussion, and live communication with the teacher. Revision in the online course format is not completely denied by students. A total of 28.2% of survey participants are ready to try this kind of educational format (Figure 4).

In the future, it is interesting to know what is associated with such an assessment of online learning:

- negative experience with online courses,
- unwillingness to self-study,
- or something else.

As for the structural organization of the online course, 80.4% of respondents named detailed analysis of solutions the most popular form of repetition. In addition, they consider training tests (67.8%), video lectures (66.5%), and short schemes (65.5%) the most useful elements of the course (Figure 5).

Research experience [22] shows the importance of studying students' opinions about the online course after its completion. To take into account the wishes of students, we decided to conduct a survey before the course, which does not exclude the final survey in order to find out problems and comments.

4. Results

A group of teachers from the Department of Data Analysis, Decision Making and Financial Technologies decided to develop a massive open online course called "Recap Everything! School mathematics for freshmen".

Analysis of scientific research, study of the learning process, and the results of surveys allowed the authors to formulate methodological approaches to the design of an online course for repetition of school mathematics.

4.1. Course Objectives

Understanding the target audience and expected results allowed us to formulate the objectives of the course:

- to check and see if the first-year students are ready to master higher mathematics,
- to fill the gaps in the knowledge of the school mathematics course,
- to get foreign students familiar with the terminology and approaches of the Russian mathematics education,
- to structure the training material for further use as a reference.

4.2. Selection of the Content

Mastering an online course is based on knowledge obtained in the framework of a school mathematics course or relevant disciplines of secondary vocational education, as well as the final state certification of graduates of general educational organizations in Russia. After completing the course, the following competencies formed in a secondary school should be updated:

- ability to solve arithmetic problems with different numbers;
- ability to perform practical calculations using formulas, including those that have degrees, radicals, logarithms, and trigonometric functions;
- ability to analyze dependencies with a graphical representation;
- ability to develop and study the simplest mathematical models, including tasks for the largest and smallest values using the apparatus of mathematics analysis.

The next step in developing an online course was to create a map of expected learning results (Supplementary Material). This map highlights teaching units, which is obligatory to know to be able to master higher mathematics, and then there is selected educational material.

The course covers almost all the material of school mathematics: elementary mathematics, algebra and the introduction to analysis. It consists of 16 topics:

1. Number sets.
2. Identical transformations of algebraic expressions.
3. Function and its properties.
4. Linear equations, inequalities, and their systems.
5. Quadratic equations and inequalities.
6. Modulus of the number.
7. Rational equations and inequalities.
8. Arithmetic square root.
9. Power function.
10. Exponential function.
11. Logarithmic function.
12. Trigonometric functions.
13. Differentiation.
14. Integration.
15. Arithmetic and geometric series.
16. Vectors.

4.3. Concept of Online Course Designing

The main focus is on the revision of functions studied in school, their properties, and related equations and inequalities. The functional approach as a substantive basis for course development is selected on purpose: according to the authors, it allows you to create a basis for further applied use of mathematical methods.

All declared functions are studied according to a single plan definition of a function, the domain and range of a function, even and odd functions, zeros of a function, fixed sign intervals, intervals of monotonicity, and the points of extrema. The function graph is mandatory in the course. Such a unified approach contributes to a deeper understanding of these properties and forms the skills of structural analysis. Along with the study of different kinds of functions, we also cover the topic of the identity transformations of the corresponding expressions and the repetition of the basic types of equations and inequalities including rational, irrational, exponential, logarithmic, and trigonometric factors.

The four final sections of the course are the most important for the study of the university's higher mathematics course:

- differentiation and integration are important in mastering mathematical analysis, regardless of the direction while receiving a bachelor's degree;
- numerical sequences and vectors can be considered as additional topics, but, at the same time, they are very useful for understanding the theory of series, mastering linear algebra, and analytical geometry.

4.4. Structure and Duration of the Course

Each single topic is followed by a video lecture, a presentation, a text version of the lecture, training tests, a brief outline, a glossary, and additional material for a deeper understanding. The authors of the course made the training manuals [31] when it was still under development.

Since the first year of the Bachelor's program involves the study of higher mathematics from the beginning of the academic year, the revision of school material should be made within the shortest period. Therefore, we offer an intensive course. It has two credits and takes up to eight or nine weeks.

4.5. Components of Control

An important part of any online course is a control system. In this case, it consists of three components, which are below:

- diagnostic test,
- practice tests,
- final test.

4.6. Principles of Creating an Individual Educational Trajectory

In developing the scenario of the course, the authors relied on the principles of formation of the individual trajectories, formulated in Reference [5]:

- the principle of the individual approach in training (the student performs tasks from those sections in which mistakes were made),
- the principle of conscious perspective (students understand that repetition will help them to master the material of higher mathematics more successfully),
- the principle of flexibility in learning (tasks of different levels of complexity and different forms are offered),
- the principle of dynamism (the ability to quickly control the execution of tests).

The course introduction starts with a diagnostic test, which all first-year students are advised to take. The diagnostic test contains tasks on all 16 topics of the course, in which the implementation or non-fulfillment gives an idea of the level of knowledge and skills mastered in school. First, this information is valuable for future students of the MOOC. It allows students to identify the gaps in school mathematics courses, and gives students the opportunity to develop an individual educational trajectory of education in the frame of online course. Thus, after taking the diagnostic test, either each student will be required to repeat the entire course or to pass only those topics in which serious errors were made when performing the diagnostic test (see Figure 6).

After that, the student should watch video lectures for each of the selected topics, which includes basic concepts and solutions of important mathematics problems on the topic, and then to do training tests. For better understanding of the topic, the student can watch the presentation, the text of the lecture, and reference materials (glossary, brief scheme). The structure of the course corresponds to manual [33], which was tested at the Preparatory Faculty of the Financial University.

The results of the training tests indicates the student's progress in learning material. In our opinion, it is important to make graded tests.

According to the functional description, we distinguish the following levels of learning (for example, Reference [34]):

- reproductive (perception, understanding, memorization),
- productive (practicing according to the model, typical problem solving, explanation),
- creative (applying knowledge in a new situation).

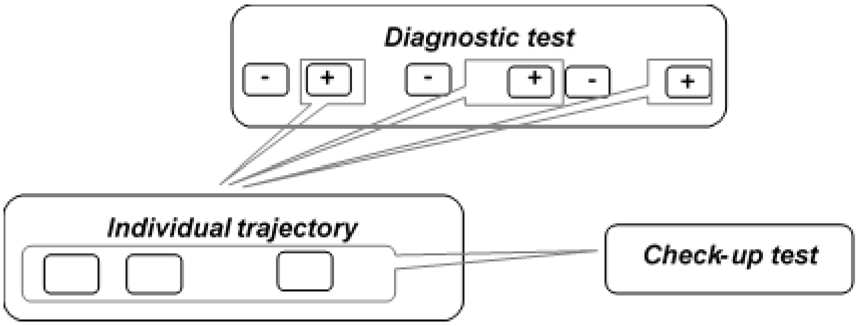

Figure 6. Formation of an individual trajectory.

The correspondence of the levels and educational achievements of students is presented in Table 2.

Table 2. Correspondence of the learning levels, actions, and educational achievements of students.

	Reproductive	Productive	Creative
Students' actions	To show (identify), name, recognize, define, retell, etc.	To determine (calculate), characterize, relate, explain, compare, make something according to a ready-made scheme, measure, follow rules, etc.	To provide an oral or written answer to a problem question, make a judgment, highlight essential features, analyze information, give and substantiate your own examples and assessments, search for necessary information, etc.
Educational achievements	Awareness (orientation)—the development of a certain amount of knowledge and the ability to reproduce it.	Literacy—the ability to solve standard everyday tasks, to use the basic methods of cognitive activity based on the existing subject knowledge and skills.	Competence—the ability to solve problems arising in the surrounding reality using the knowledge from the subject.

The authors consider the reproductive level to be insufficient for mastering the disciplines of higher mathematics. At the same time, knowing that the development process ranges from simple to complex, the test tasks are differentiated.

Due to the indicated levels, the approach to make graded tests has been created. The first problem in the test is to recognize an educational object. The problem corresponds to the reproductive level of mastering the content. For example,

- *Is the statement true: (a)* $-11 \in N$; *(b)* $11.1 \in Z$; *(c)* $0.(1) \in R$; *(d)* $0 \in N$?
- *The sides AB and CD of the isosceles trapezoid ABCD with the base AD are divided into two equal parts by the points K and M. Are the vectors equal here? (a)* $\overrightarrow{AB}$ and $\overrightarrow{DC}$; *(b)* $\overrightarrow{AK}$ and $\overrightarrow{KB}$; *(c)* $\overrightarrow{BC}$ and $\overrightarrow{AD}$; *(d)* $\overrightarrow{AK}$ and $\overrightarrow{DM}$?

The following tasks require students to apply their knowledge in a known situation, and, therefore, correspond to an already productive learning level.

- *Find the values of the following expressions:*

$$(a)\ \frac{1.92 \cdot 0.244}{0.192 \cdot 2.44};\ (b)\ \left(4\frac{1}{4} - 2\right) \cdot 6\frac{2}{3};\ (c)\ \left(5\frac{1}{3} + 2\right) : \frac{5}{21};\ (d)\ \left(728^2 - 26^2\right) : 754.$$

- *Find a vector $\vec{x}$ from the given equation:*

$$4\vec{a} + \vec{b} + 2\vec{c} - \vec{x} = -3\vec{a} - 5\vec{c} - 5\vec{x},\ if\ \vec{a} = (-2; 5; 3), \vec{b} = (5; -6; 3), \vec{c} = (-6; 5; -2).$$

In the framework of the online course, we offer tasks of increased complexity that also reflect the productive level of development, but require the student to accumulate all the competencies on this topic. The example is the mathematics problem taken from the topic of "Progressions".

- *The young entrepreneur received a revenue of 5000 rubles in 2015. Each following year his revenue was increasing by 300% compared with the previous year. How much did the entrepreneur earn in 2018?*

There is an opportunity to expand and deepen knowledge by studying the material "Know more" offered in each topic of the online course and contains additional information on topics. This part of the course contains information that will be useful for the students in learning mathematics at the university.

The online course ends with a checkup test, which is developed in accordance with the student's individual educational trajectory, i.e., contains tasks on topics that have been studied.

The results of the study [18] show that the lack of time limits on the online course and the number of attempts increase the amount of students actively involved in online learning. The authors also do not plan to limit the time for the tests and do not recommend to take into account the assessment for the online course when grading in higher mathematics.

Further development of the offered adaptive course may be associated with the development of thematic case studies [35,36]. These kinds of tasks will correspond to the creative level of mastering the content, which will allow students to receive certificates of different levels after completing the online course.

4.7. Selection of Teaching Materials for Individualization of Training

As for the individualization of the learning process, it is impossible to ignore the peculiarities of the learning processes of students. We paid great attention to the creation of teaching materials that take into account various types of the most important cognitive processes (perception, memory, thinking) while developing this online course.

Perception allows a person to reflect reality and is considered to be a foundation for the development of other mental functions: memory, thinking, and imagination. According to V.D. Shadrikova [37], "to ensure the completeness of perception, it is necessary that the verbal and logical form is combined with a figurative presentation, textual presentation with a graphic representation, and visual perception with practical actions." This kind of structure of teaching materials will provide each listener with the most adapted form of perception.

Electronic learning tools offer wide opportunities to engage all types of perception. There are a number of publications on how to implement these opportunities.

While creating the didactic materials, the authors used the results of the studies [38], which describe educational and methodological materials developed specifically for students with a dominant left and with a dominant right hemisphere.

Thus, for the individualization of the learning process, the invariant content of the theoretical and practical educational material is presented in a variable form. It is known [37] that people with a higher developed function of the right hemisphere had better perceive the entire picture and pattern information, whereas people with a higher developed function of the left hemisphere receive better separate information expressed in formulas and numbers such as, when creating slides for a presentation, the most important information was duplicated in different forms. In the study [39], the author considers appropriate options for presenting information for students with visual, audial, and tactile abilities, which were also taken into account by the authors of the online course in the development of teaching materials.

While developing the materials of the adaptive online course “Recap everything!” the authors tried to use all means of information representation, paying special attention to its content and form structure. To be more exact, each section is represented with the following teaching materials: video lesson with a presentation, lecture text, training tests, a glossary, a brief (reference) section diagram (small note on the topic), and a presentation with additional material.

The video lesson followed by a presentation involves all the channels of perception to a considerable degree, since it combines visual information with the teacher's explanation. We relied on research [15,16], which proves the preference of explaining the material with the presence of the lecturer on the screen. Great attention was paid to the openness and goodwill of the lecturer. The important role of these qualities is confirmed in the work [13].

At the same time, Reference [15] indicates that there are a number of students for whom the face of the lecturer on the screen is undesirable. In the described course, this problem is solved by the presence of a section in the presentation materials without a lecturer.

The information on the slides is structured, following a single scheme for similar learning objects (for example, when describing basic elementary functions). Each slide has little information, which is important for better understanding and memorizing the main points are highlighted and even take into account the position of the information on the slide. Only the most necessary information is displayed. Definitions and rules are followed by examples i.e., in this case, perception occurs through action. Generalization, in some cases, uses a principle of “from the general to the particular,” which is better perceived by students with a synthetic form of perception (the picture is perceived as an entire object), and, in some cases, “from the particular to the general” for students who have a more developed analytical form of perception (separate parts are perceived). An example of the information organization on a slide can be viewed in Appendix A. A diagram showing different aspects of perception involved in watching a video lesson is displayed in Figure 7.

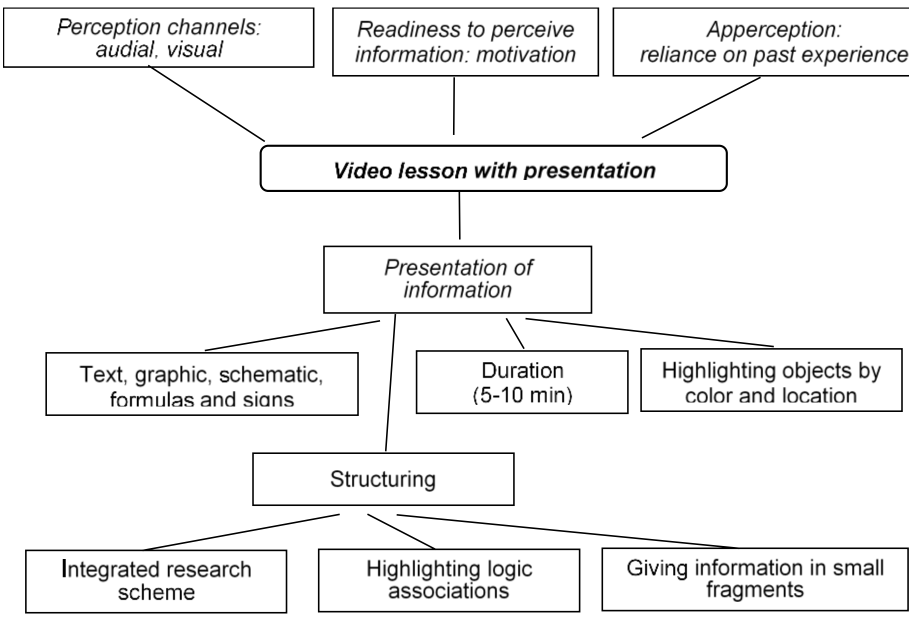

Figure 7. Structural scheme of information perception.

When creating video lectures, the recommendations presented in the study [17] were used. They concerned the duration of the video, the speed of the image, and the general composition of the frame.

Each video lesson ends with a training test. Different types of tasks were used to develop them: textual questions, matching and logic chain exercises, computational tasks, and exercises related to the analysis of graphs. Examples of test tasks can be found in Appendix B.

There is a brief scheme with the most important information and structural and logical links on each topic. It allows structure material for the topic and highlights the main points. Such schemes are very handy as reference material. The importance of such schemes is described in the monograph [4]. The author calls them semantic cognitive maps. In particular, the work provides recommendations for their preparation, which were used.

Examples of several schemes are presented in Appendix C.

Therefore, in order to recollect school mathematics material as quickly as possible, the authors tried to present the educational information of the online course in different forms. This contributes to the complex perception of the course material, its understanding, and memorization.

4.8. Designing Additional Course Features

Special attention was paid to the design of the course for foreign students. Recently, foreign students are more common in Russian universities. Teaching mathematics for such type of students requires some specifics: first, it is necessary to form the terminological base of the mathematics apparatus in the Russian language, and then get students familiar with the methods of solving problems. Formation of the terminological base includes knowledge of the term, understanding its meaning, and the ability to use it in practice.

In this context, Reference [24] is of interest. It explores the relationship between the study of the course by non-native English speakers and its effectiveness. It is argued that there is a positive and significant correlation between the self-efficacy of non-English learners and self-regulated learning in MOOC. Thus, the authors suggest that the study of the course by foreign students in a foreign language will have a positive impact on the knowledge of mathematics and knowledge of the Russian language in general.

The experience of teaching at the pre-university course for foreign students [40] showed that such students face difficulties in understanding descriptive wording of mathematical concepts and rules in Russian, given in written and, especially, in oral form.

The authors of the online course have compiled a glossary of mathematical concepts, which includes their meanings, pronunciation, and context where it is used. Since an important goal of the course lies in updating the terminological base, one of the diagnostic forms is aimed at checking the knowledge of mathematical notations, definitions, and terms. In the diagnostic task, it is required to match the term and its meaning. For students who are not fluent in Russian, it was decided to voice the name of the terms and their meanings in Russian. Thus, it becomes possible to create a whole range of training tasks of different levels of complexity:

- listen to the voiced definition or wording of the term and select the appropriate meaning,
- select an appropriate written explanation of the term,
- listen to the statement and select the appropriate term, etc.

Moreover, the students compose some of the questions to control the level of understanding of the mathematical text in Russian, so, in this case, mathematical symbols are not used. Below are two examples.

1. Match the statements.

Mathematics Symbols and Formulas	Name and Meaning
1. $a^m \cdot a^n = a^{m+n}$	***A.*** *When a degree is raised to a degree power, the indicators multiply.*
2. $\frac{a^m}{a^n} = a^{m-n}$, $a \neq 0$	***B.*** *When dividing degrees with the same indicators, one base is divided by another, and the indicator remains unchanged.*
3. $(a^m)^n = a^{m \cdot n}$	***C.*** *When multiplying degrees with the same indicators, the bases are multiplied, and the indicator remains the same.*
4. $a^n \cdot b^n = (ab)^n$	***D***. *When multiplying degrees with the same bases, indicators are added up.*
5. $\frac{a^n}{b^n} = \left(\frac{a}{b}\right)^n$, $b \neq 0$	***E.*** *When dividing powers with the same bases, the divisor is subtracted from the index of the dividend.*

2. Choose the correct statements:

   (a) *The logarithmic function is defined on the set of non-negative numbers.*
   (b) *The logarithmic function increases on the domain of definition, provided that the base is greater than one.*
   (c) *The logarithmic function is odd.*
   (d) *The logarithmic function has a maximum point, but no minimum point.*
   (e) *Exponential and logarithmic functions are mutually inverse.*

Training terminological exercises will help foreign students to adapt their existing knowledge to further train in the Russian language.

Another group of first-year students who need additional support is college graduates who have decided to continue their studies at the university. As noted earlier, they stop studying mathematics several years before they graduate from the college, so they need a deeper revision. The offered course will undoubtedly be useful for such students, but there must be a wider and more extensive training base for them. These can be special mathematical simulators for independent study, where the design can serve as a promising task for course developers.

5. Discussion

Let us summarize some of our results. Monitoring and studying the opinions of students and the vast experience of teaching higher mathematics in the first academic year allowed the authors to formulate a hypothesis about the need to design a course that structures the school mathematics material. The survey of students showed the relevance of this decision. The study allows designing a course that adapts students of different levels of preparation for the successful progress of higher mathematics. The course is based on the opportunity of developing an individual trajectory of a student, taking into account his level of knowledge and skills. The teaching materials were developed by taking into account the peculiarities of perception of a wide range of listeners, whereas the system of tasks was built according to the degree of increasing learning levels.

The course is designed in a massive open online course format, which is explained by the popularity and relevance of this format, the universality of approaches to teaching mathematics at universities, and the integrated intensive pattern of the course itself.

While working on the creation of the course, the authors actively used the recommendations of scientific research in the field of online education. The recommendations presented in Reference [25] on MOOC design issues were useful. They are:

- program structuring,
- expert evaluation,
- election of tasks based on practical content.

While preparing video materials, the results of studies [15–17] have been taken into account. Recommendations after the first edition of the course, formulated in article [26], aroused the interest of the authors. We fully agree that, after the start of testing, it is necessary to monitor the compliance of the level of content with the needs of students, design, and feedback efficiency. It is especially important for our course to monitor the formation of individual trajectories of students, using the analysis of user strategies described in research [19].

The idea of gamification of online courses, the effectiveness of which is noted by many researchers (for example, article [21]), seems useful to us. The authors are planning to add cases to each section that will help students not only in the study, but also in the accumulation of additional points to the final tests.

Many authors [19,20,22] note that the motivation for successful completion of the course increases if the operational feedback exists. In our case, the tutor support of the course needs careful study. We consider this activity to be a priority for further research.

6. Conclusions

The study allows the authors to formulate approaches and techniques for the creation of modern online courses. The design of the online course is based on the concept of the learning process individualization, which is widely used in pedagogy [2,3]. In this paper, the ideas of individualization have been developed with respect to online education, which, in our opinion, will contribute to the improvement of this modern and popular process.

The main goal of the course is to prepare (adapt) undergraduates to the study of higher mathematics.

The scenario of the course and didactic materials were developed by taking into account the possibility of formation of an individual educational trajectory. This means that the study of courses adapts to each student.

Thus, on the one hand, the developed course is adaptive on the target component and, at the same time, adaptive in the learning process. This double characteristic of the course, according to the authors, increases its social significance.

The study presents the developed methodological approaches that can be used in the design of online courses:

- to determine course objectives;
- to select suitable content;
- to develop online course concept;
- to generate control components;
- to develop course structure;
- to take into account principles of creating individual educational trajectories;
- to select teaching materials for individualization of training;
- to design additional course features for special groups of students.

The target audience of the course are students enrolled in the University. The universality of the approach to teaching mathematical disciplines allows the authors to hope that the course will be useful and in demand for a large number of first-year students. The course will help to master mathematics more effectively at the University. The need for this knowledge for further training is demonstrated in the table, which shows the relationship of the online course material with the sections of higher mathematics studied in the first year (Appendix D).

In addition, the developed content has an extra positive value for international students in the study of mathematical terminology in Russian.

An important issue, which will contribute to the promotion of the online course, is its integration into the educational process. The study of this problem is covered by several works [10], which the authors plan to use in their further research. The survey of students' opinion demonstrates their high demand for traditional classes conducted by a teacher. Therefore, the authors plan to consider the possibility of using the course with mixed learning. Useful recommendations on the organization of such training are presented in article [8].

In the future, the authors plan to expand on other aspects, such as creating feedback tools, adding elements of gamification, and selecting tasks with practical content. Some relevant aspects of these issues have already been considered in the scientific sources mentioned above.

Supplementary Materials: Supplementary materials can be found at http://www.mdpi.com/2227-7102/9/3/182/s1. Table S1: Learning Outcomes.

Author Contributions: Conceptualization, L.K. and I.S.; Data curation, L.L.; Formal analysis, L.K. and A.R.; Investigation, I.S., L.K. and G.P.; Methodology, L.K. and I.S.; Software, G.P.; Supervision, A.R. and L.L.; Visualization, L.K. and L.P.; Writing—original draft, L.K., G.P. and I.S.; Writing—review & editing, L.K., G.P. and I.S.

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Conflicts of Interest: The authors declare no conflict of interest.

Appendix A

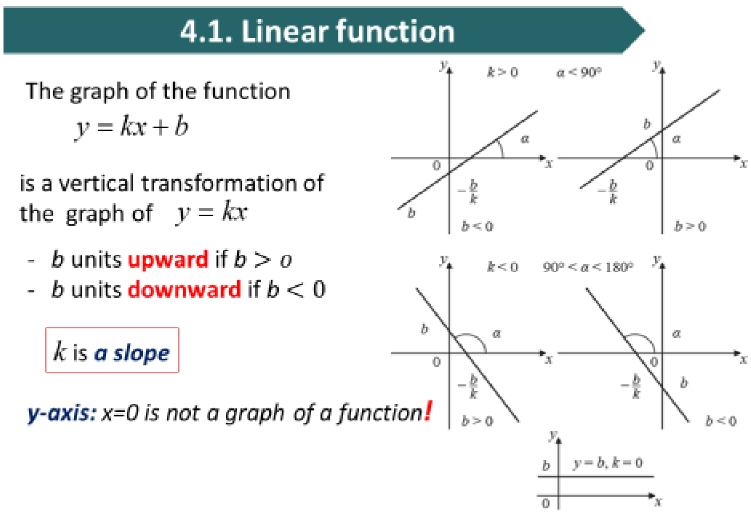
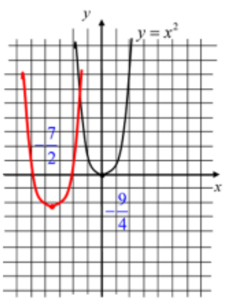


Figure A1. Extract from presentation "Linear equations, inequalities, and their systems".



$$y = x^2 + 7x + 10$$

$$y = \left(\underbrace{x^2}_{a^2} + 2 \cdot \underbrace{x}_{a} \cdot \underbrace{\frac{7}{2}}_{b} + \underbrace{\left(\frac{7}{2}\right)^2}_{b^2}\right) - \left(\frac{7}{2}\right)^2 + 10 =$$

$$= \left(x + \frac{7}{2}\right)^2 - \frac{49}{4} + 10 = \left(x + \frac{7}{2}\right)^2 - \frac{9}{4} =$$

$$= \left(x - \left(-\frac{7}{2}\right)\right)^2 + \left(-\frac{9}{4}\right)$$

$$\boxed{y = (x-m)^2 + n}$$

- *horizontal shift m units to **the right** (m>0), **left** (m<0)*
- *vertical shift n units **upward** (n>0), **downward** (n< 0)*

Figure A2. Extract from presentation "Quadratic equations and inequalities".

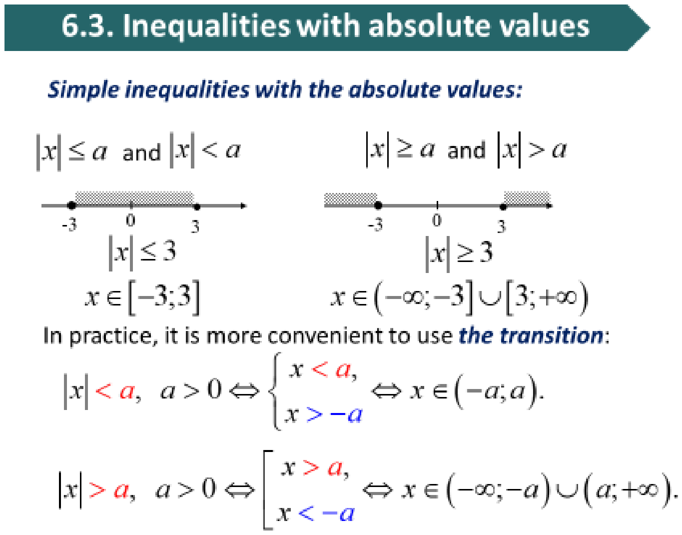


Figure A3. Extract from presentation "Modulus of the number".

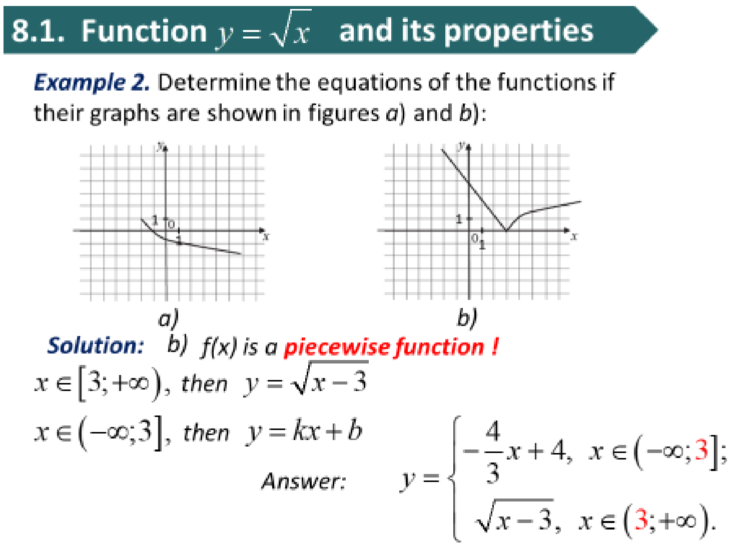


Figure A4. Extract from presentation "Arithmetic square root".

Appendix B

1. Test problem on topic "Identical transformations of algebraic expressions"

Select the exact match:

Mathematical symbols and formulas	Formula names and corresponding rules
1. $(a+b)^2 = a^2 + 2ab + b^2$	***A.*** *The square of the difference of two expressions equals the first expression squared, minus their doubled product, plus the second expression squared.*
2. $(a-b)^2 = a^2 - 2ab + b^2$	***B.*** *The difference of the squares of two expressions is the product of the sum of these expressions on their difference.*
3. $a^2 - b^2 = (a+b)(a-b)$	***C.*** *The sum of two expressions cubed.*
4. $(a+b)^3 = a^3 + 3a^2b + 3ab^2 + b^3$	***D.*** *Sum of the cubes of two expressions.*
5. $a^3 + b^3 = (a+b)(a^2 - ab + b^2)$	***E.*** *The square of the sum of two expressions equals the first expression squared, plus their doubled product and the second expression squared.*

Choose the correct answer:

(a) 1-A, 2-B, 3-C, 4-D, 5-E;

(b) 1-D, 2-E, 3-A, 4-C, 5-B;
(c) 1-B, 2-C, 3-A, 4-D, 5-E;
(d) 1-E, 2-A, 3-B, 4-C, 5-D;
(e) 1-C, 2-B, 3-D, 4-A, 5-E.

2. Test problem on topic "Linear equations, inequalities, and their systems"
Select the condition you want to insert for the text to be correct.

$$\textit{The system of linear equations} \begin{cases} a_1x + b_1y = c_1, \\ a_2x + b_2y = c_2; \end{cases} \textit{has exactly one solution if } \_\_\_\_\_\_\_\_.$$

Choose the correct answer.

(a) $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$;
(b) $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$;
(c) $\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$;
(d) $\frac{a_1}{a_2} \neq -\frac{b_1}{b_2}$;
(e) $\frac{a_1}{a_2} = -\frac{b_1}{b_2}$.

3. Test problem on topic "Power function"
For what values of the expression $\sqrt[3]{\sqrt{-a}}$ is defined?

(a) $a > 0$;
(b) $a < 0$;
(c) $a \leq 0$;
(d) $a \in R$;
(e) $a \geq 0$.

4. Test problem on topic "Logarithmic function"
Identify the formula for the function graphed in the following Figure A5.

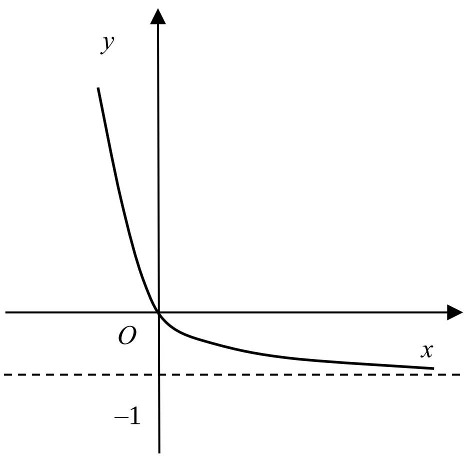


Figure A5. Function graph.

Choose the correct answer:

(a) $y = \log_{0.5}(x-1)$;
(b) $y = 2^{x-1}$;
(c) $y = \log_2 x - 1$;

(d) $y = 0.5^x - 1$;
(e) $y = \log_{0.5} x - 1$.

Appendix C

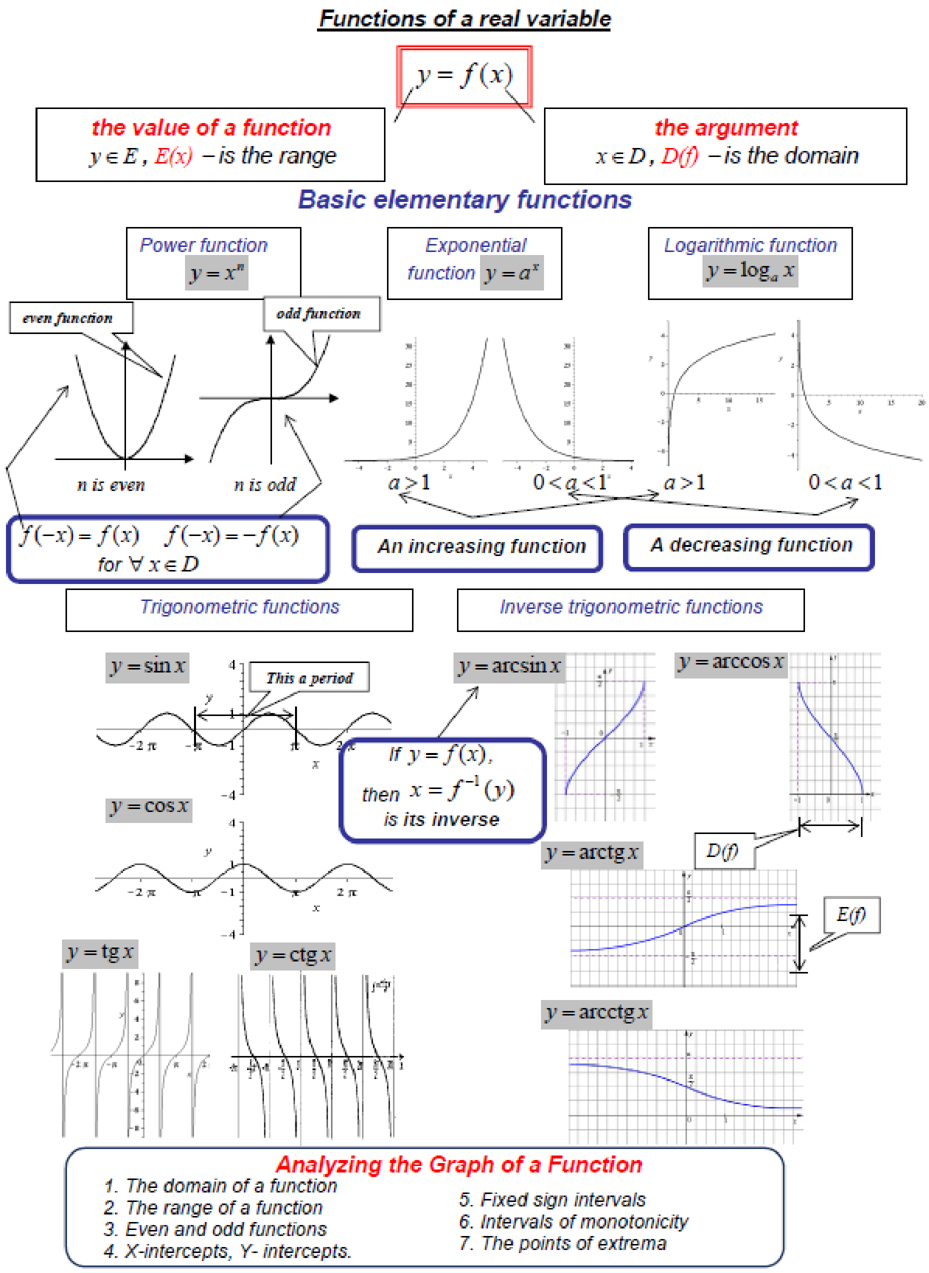
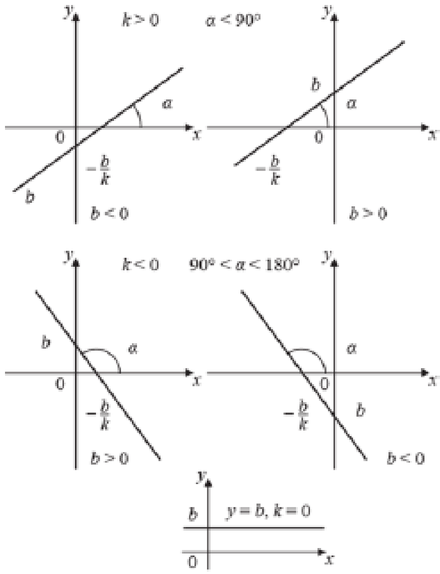


Figure A6. Scheme for the topic "Function and its properties".

Linear function $y = kx + b$

k – is **the slope**

$k > 0$	$0° < \alpha < 90°$	acute angle
$k < 0$	$90° < \alpha < 180°$	obtuse angle
$k = 0$	$\alpha = 0°$	the line is parallel to the x-axis or coincides with it

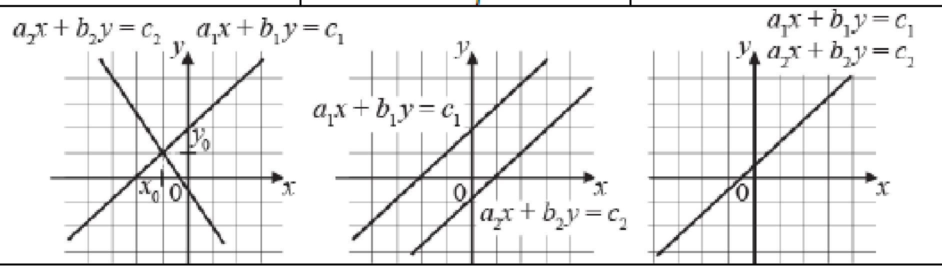


Linear equation $ax + b = 0$

Parameters	*Solution*	*Number of solutions*
$a \neq 0$	$x = -\dfrac{b}{a}$	exactly *one* solution
$a = 0,\ b \neq 0$	$0 \cdot x \neq -b$	*no* solutions
$a = 0,\ b = 0$	$0 \cdot x \equiv 0$	*infinitely many* solutions

Systems of linear equations $\begin{cases} a_1x + b_1y = c_1, \\ a_2x + b_2y = c_2. \end{cases}$

Exactly one solution	*No solutions*	*Infinitely many solutions*
$\dfrac{a_1}{a_2} \neq \dfrac{b_1}{b_2}$	$\dfrac{a_1}{a_2} = \dfrac{b_1}{b_2} \neq \dfrac{c_1}{c_2}$	$\dfrac{a_1}{a_2} = \dfrac{b_1}{b_2} = \dfrac{c_1}{c_2}$
lines intersect	*lines are parallel*	*lines coincide*



Linear inequalities

$ax + b > 0,\ ax + b \geq 0,$

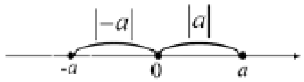
$ax + b < 0,\ ax + b \leq 0$

$<\ >$	$\geq\ \leq$
the point is *excluded*	the point is *included*
( )	[ ]

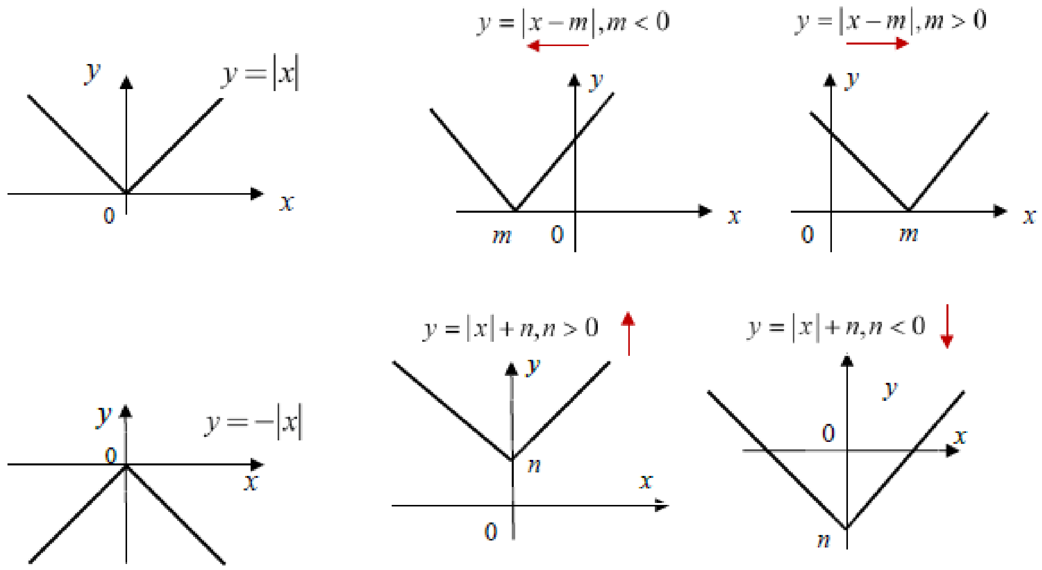
System of inequalities	*Set of* inequalities
$\begin{cases} f(x) > 0, \\ g(x) \leq 0. \end{cases}$	$\left[\begin{array}{l} f(x) > 0, \\ g(x) \leq 0. \end{array}\right.$
intersection of intervals	*union* of intervals

Figure A7. Scheme to the topic "Linear equations, inequalities. and their systems".

Absolute value of a number

geometrical approach	*algebraic approach*
The distance from the point 0 to the origin without any regard to the direction 	$\lvert a\rvert=\begin{cases} a, & a\ge 0;\\ -a, & a<0.\end{cases}$

Function $y=|x|$



Equations containing the module	*Inequalities containing the module*
$\lvert x\rvert=a,\ \ a>0\Leftrightarrow\left[\begin{array}{l} x=a,\\ x=-a.\end{array}\right.$	$\lvert x\rvert\le a,\ \ a>0\Leftrightarrow\begin{cases} x\le a,\\ x\ge -a;\end{cases}\Leftrightarrow x\in[-a;a]$
	$\lvert x\rvert\ge a,\ \ a>0\Leftrightarrow\left[\begin{array}{l} x\ge a,\\ x\le -a;\end{array}\right.\Leftrightarrow$ $\Leftrightarrow x\in(-\infty;-a]\cup[a;+\infty)$
$\lvert A(x)\rvert=B(x)\Leftrightarrow\begin{cases}\left[\begin{array}{l} A(x)=B(x),\\ A(x)=-B(x),\end{array}\right.\\ B(x)\ge 0-\text{ОДЗ}.\end{cases}$	$\lvert A(x)\rvert\le B(x)\Leftrightarrow\begin{cases} A(x)\le B(x),\\ A(x)\ge -B(x).\end{cases}$
	$\lvert A(x)\rvert\ge B(x)\Leftrightarrow\left[\begin{array}{l} A(x)\ge B(x),\\ A(x)\le -B(x).\end{array}\right.$

Figure A8. Scheme for the topic "Modulus of a number".

Appendix D

Table A1. The relationship of the adaptive online school math course with didactic units of the course "Mathematics" for bachelors.

Didactic units of the University Mathematics course / Topics of the adaptive course of school mathematics	Sets of numbers and functions. Set of complex numbers	Limits and Continuity	Differential Calculus of Functions of a Single Variable	Analyzing the Graph of a Function and Curve Sketching	Integration Calculus of Functions of a Single Variable	Functions of Several Variables	Series. Power Series	Differential Equations	Linear Space. Vectors and Matrices	Systems of Linear Algebraic Equations and Inequalities	Linear Space, Linear Transformations	Eigenvalues and Eigenvectors. Linear Exchange Model	Quadratic forms and Conics	Elements of Analytic Geometry	Linear Programming
Topic 1. Numerical sets and the line coordinates	*	*	*	*	*	*	*	*	*	*	*	*	*		*
Topic 2. Identical simplifying of algebraic expressions	*	*	*	*	*	*	*	*	*	*	*	*	*		*
Topic 3. Functions. Properties of a function	*	*	*	*	*	*	*	*			*		*		*
Topic 4. Linear equations and inequalities. Systems of Linear equations and inequalities		*	*	*	*	*	*			*			*		*
Topic 5. Quadratic Equations	*	*		*	*	*	*					*	*		
Topic 6. The absolute value of a number		*		*			*		*						
Topic 7. Rational equations and inequalities	*	*	*	*	*	*	*						*		
Topic 8. Square root	*	*	*	*	*	*	*								
Topic 9. Power function	*	*	*	*	*	*	*								
Topic 10. Exponential function	*	*	*	*	*	*	*								
Topic 11. Logarithmic function	*	*	*	*	*	*	*								
Topic 12. Trigonometric functions	*	*	*	*	*	*	*								
Topic 13. The Derivative of a function		*	*	*	*	*	*	*							
Topic 14. Antiderivative and Integral					*	*	*	*							
Topic 15. Arithmetic and Geometric sequences		*					*								
Topic 16. Vectors							*		*		*	*	*	*	*

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