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ABOUT METHODS FOR SOLVING PARAMETER-DEPENDENT EQUATIONS

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Abstract

This article related to the preferred methods of solving equations, in certain areas, the value of the overall solution, to solve equations more common methods specified in

Key words: parameter, equation, function definition area.

Introduction

Parametric issues Modenov P.S., Modenov V.P., Novoselov S.I., Bashmakov M.I., Dorofeev G.V., Mordkovich A.G., Saransev G.I., Litvinenko V.N., Vavilov V.V., Olekhnik S.N., Potapov M.K., Garbachev V.I. data are given. G.A.Yastrebinetsky's [1] methodological manual for teachers on the solution of parametric equations and inequalities is noteworthy. Issues in this direction are also described in the books published in uzbek by Kutsenko E.N., Melnikov N.N [2], Umirbekov A.U., Shaabzalov Sh.Sh [4] and [5,16,19,24,26,31]. In the journal "Mathematics in school" [7,10,11,12], in the journal "People's education" [8,9], in the journal of Physics, Mathematics and Informatics [14,15,17,18,20,21,22, 23,25,29,30]. Analysis of scientific and methodological articles on parametric equations and inequalities published in recent years shows that parametric problems are not classified, methods of solving them are not systematized and generalized. There are also overlapping results where the linear and quadratic equations are studied almost completely in relation to the parameter [6,7,8,9, 11,12,18,25,30]. In particular, the location of the square zero zeros in [32,33,34,35,36] is described in detail.

There is still no consensus on the definition of parameter-dependent equations and inequalities and the concept of their solutions. We conduct our research within the following definitions. Suppose the variables depend on:

$$f(a,b,c,...,k,x) = \varphi(a,b,c,...,k,x) \qquad (1)$$

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Let the equation be given. Here f and φ some elementary functions.

Definition 1. If equation (1) characters as a variable, it considers (1) with respect to the parameters related to the equation is called.

It is usually denoted $a,b,c,...,k,x$ by letters, such as parameters, and the unknowns are denoted by x,y,z,t letters.

Definition 2. The set of values of all the variables involved in a parameter-dependent equation that convert both sides of the equation to a real number is called the range of values that the variables can accept .

For example: $\frac{3nx+5}{(m-2)nx}-\frac{5nx-2}{n+3}=\frac{n-2}{nx}$ (2)

for the equation n and the m parameters are x unknown. You can accept the values of the variables , a set of chord. Parametric equations can also be thought of as a family of equations.

For example: (3) from the family of equations (in particular)

$n=1,\ m=3$ when, $\frac{3x+5}{x}-\frac{5x-2}{4}=-\frac{1}{x}$ (3)

$n=2,\ m=4$ when, $\frac{6x+5}{8x}-\frac{10x-2}{5}=0$ (4)

Equations (3), (4) can be generated. (3) and (4) are called special equations of (2).

The concept of solution of parametric equations is not introduced, but the concepts of "general solution" and "solution of parametric equations" are introduced. The general solution concept for Equation $F(x,a)=0$ (5), which depends on a single parameter, is defined as follows.

Definition 3. If you can accept parameter a values derived A from the voluntary values $a_i \in A$ satisfy the equation $x=f(a_i)$ (5), $F(f(a_i);a_i)=0$ (6), in which case the function $x=f(a)$ equation (5) is called the general solution A in the collection $(i=\overline{1,n})$.

Definition 4. Solving a parametric equation means finding all the general solutions defined in the parameter field or showing that the parameter does not have a solution.

Definition 5. The domain of equation (5) is the set of possible values of the parameter and (6) the domain of equations .

Similar definitions to the above are also included for parameter-related inequalities.

Analyzing the methodological literature and scientific-methodological articles on the equations related to the parameter, we came to the conclusion that research in this area can be divided into the following groups:

1. Works classified in terms of use in competitions and presented with solutions.
2. Works that explain concepts, definitions, and solution methods for teachers.
3. Recommendations and assignments for students of educational institutions with in-depth study of mathematics.
4. Works devoted to the study of specific goal-oriented features of some parametric problem classes.

In our opinion, the development of a methodological system for teaching parametric equations in academic lyceums is one of the current problems in teaching mathematics.

Basic methods of solving parametric problems.

Method - 1 (Analytical). A method of direct use of standard algorithms for finding solutions to parametric problems .

Method - 2 (Graph). Depending on the problem (graphs of variable and parameter-a dependent f-functions) is a way to create graphs either in the coordinate plane or in the coordinate plane.

Method - 3 (Solving with respect to the parameter). In this solution method, and the variables are considered equal, and the analytic solution is chosen, the variable is simply derived. After the natural simplifications and we return to the original meaning of the variables and complete the solution.

The study of parametric equations should begin after mastering the methods of solving linear, quadratic, fractional-rational equations, because the parametric equation is linear with respect to the main variable and the formation of the quadratic equation with respect to the auxiliary variable (parameter). possible.

For example: $a^2x+3ax+1=2a+6x$

x - variable linear, compared to a variable quadratic equation. Parametric equations have a very strong correlation relation to the methods of solving equations and the types of equations. Therefore, solving a one-parameter equation with a complete analysis requires a lot of work from the reader.

For example: $\frac{3nx+5}{(m-2)nx}-\frac{5nx-2}{n+3}=\frac{n-2}{nx}$

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For the equation n and the m parameters, x unknown. The range of values that a variable can accept is a set of numbers $m \neq 2, n \neq -3, n \neq 0, x \neq 0$ that satisfy the conditions.

It can also be used as a research paper for gifted students on such issues. In the process of solving parametric equations and inequalities, the possibility of performing the functions of teaching, educating and developing students becomes clear.

In practice, the textbook "Fundamentals of Algebra and Mathematical Analysis" for academic lyceums also contains tasks related to parameters. In our opinion, the integration of parametric equations into the curricula of secondary schools and academic lyceums will further expand the opportunities for the implementation of educational and developmental functions of mathematics.

Parametric equations in appearance that depend on a parameter and x an unknown $F(x,a)=0$ variable cannot be fully applied in the general case of an F arbitrary function. In special cases, when it consists of linear, quadratic and fractional-rational functions, it is expedient to talk about "general methods" of their solution. Typically, methods are classified according to the student's learning activities as follows: general teaching methods - does not depend on the subject being studied, general mathematical method - is used in all mathematical subjects, special methods - when taken separately used in the teaching of mathematical subjects (for example: arithmetic, algebra, geometry, basics of analysis), special methods - methods used to solve problems on a particular topic or a narrow range.

As a result of the analysis of the literature on mathematical methodology, we came across different definitions of the concept of generalized method. We conduct our research within the following definition: by analyzing specific methods for solving a particular parametric problem, we understand the algorithm of the system of activities that contains the content that is common to them.

As a result of the analysis of textbooks on the basics of algebra and analysis for general education and academic lyceums, we have witnessed that parametric problems are presented as intermediate tasks, ie non-compulsory tasks. Many students and teachers noted the difficulty of parametric issues in their responses to the questionnaire. Taking into account the above, we believe that

the following sequence of steps should be followed in order to form in the minds of students generalized methods of solving parametric problems:

1. Didactic preparation stage;
2. Psychological preparation stage;
3. The stage of organizational and methodological preparation.

An example is a generalized algorithm for solving parametric linear equations:

1. Visualize the equation $ax = b$ and find the set of values that the parameter can accept.
2. We distinguish the satisfying values of the parameter $a = 0$ and $b = 0$ the equations.
3. In the set of conditional values of the parameter $a \neq 0$ we find the general solution of the equation.
4. We write solutions that are appropriate for all cases.

Masala. t at what values of the parameter

$$(a_1t^2 + b_1t + c)x = a_2t^2 + b_2t + c_2 \qquad (7)$$

equation a) will have a single solution b) will not have a root c) will have an infinite number of roots?

Solution: Considering the definitions $A = (t : a_1t^2 + b_1t + c = 0)$, $B = (t : a_2t^2 + b_2t + c_2 = 0)$, we can consider the following cases according to the confirmation.

1. If, $D_1 = b_1^2 - 4a_1c_1 < 0$ then, $A = \theta$ at any $t \in R$ (7) has a root to a single solution, and this is equal to the root $x = \dfrac{a_2t^2 + b_2t + c_2}{a_1t^2 + b_1t + c_1}$.

2. If , in the following cases :

a) $t \notin A$ if (7) has a single root.

b) $t \in A$ if (7) has no root.

3. If $D_1 = b_1^2 - 4a_1c_1 \geq 0\ (A \neq \theta)$ and $D_2 = b_2^2 - 4a_2c_2 < 0\ (B \neq \theta)$, according to the confirmation, the following $A \cap B = \theta$ three conditions may also occur:

a) $t \notin A$ if (7) has a single root.

b) $t \in A, t \in B$, (7) does not have roots.

c) $t \in A \cap B$, (7) has an infinite number of solutions.

The main functions (tasks) of parametric problems in mathematics education are as follows.

1. Educational (training) - contests preparing for tests, such as: secondary and higher education institutions, preparation for the Olympics and tournaments unknowns, solving equations and inequalities Bo ' systematization of knowledge, generalization of skills in solving equations and inequalities.
2. Developer - Develop research skills and competencies, self-control skills and creativity in students.
3. The education of - scientific knowledge and personal qualities (mahnatsevarlik purpose, aspiration, strength training, organization).

Parametering all types of equations and inequalities creates a wide range of possibilities when creating control materials (questions, assignments, tests) to measure and assess students 'knowledge, skills, and competencies. It could also be the basis for the creation of other forms of tests issued by the state testing center.

The role of parametric tasks in the development of such features as the development of students' thinking skills, adaptability to different situations is great. The possibilities of parametric equations and inequalities are very wide, especially in the preparation of equally powerful tasks. From a methodological point of view, the use of parametric tasks in the analysis and synthesis in the transition from specific to general or from general to specific in the presentation of new topics accelerates mastery.

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