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METHODS OF SOLVING SOME SYSTEMS OF EQUATIONS

The topicality of the paper is that solving systems of equations has always been interesting for scholars. Besides, not every system of equations can be reduced to a standard system after changing or a successful substitute of variables for which there exists a certain solving algorithm. In such cases it is useful to apply other methods of solving described in this paper.

To reveal the content of both, the basic and artificial methods of solving systems of equations is the **purpose** of the paper.

Let's study the cyclical systems of equations and one of the methods of their solving.

Consider the system of equations in general [2]:

$$\begin{cases} F(x_1, x_2, \dots, x_{n-1}, x_n) = 0, \\ F(x_2, x_3, \dots, x_n, x_1) = 0, \\ \dots\dots\dots\dots\dots\dots\dots\dots \\ F(x_{n-1}, x_n, \dots, x_{n-3}, x_{n-2}) = 0, \\ F(x_n, x_1, \dots, x_{n-2}, x_{n-1}) = 0, \end{cases} \qquad (1)$$

where function F depends on n variables $x_1, x_2, \dots, x_n \in X \subset R$. After the cyclical substitute of $x_1 \to x_2 \to \dots \to x_n \to x_1$ we obtain the system which has the same equations but they are placed in a different order. A conclusion can be made that these systems coincide. Such systems (1) are named **cyclical systems.**

All known methods of solving systems can be adequately applied for cyclical systems, but there is one more method which fits only cyclical systems. It helps to change our system into one equation. Let's analyze it on the example [1]:

Method of reduction to a confluent equation

Exercise 1. $\begin{cases} x - y = \sin x, \\ y - x = \sin y. \end{cases}$

Solution. Let $x = y = t$ and write down a confluent equation of our system $\sin t = 0$. Numbers such as πn, where $n \in Z$ is the solution of this equation. That's why $(\pi n, \pi n), n \in Z$ –solutions of this system.

Now let's prove that the system has no other solutions. Let $x = a, y = b$ – solution of the system, where $a \neq b$. When we insert it into the equation of the system and subtract from the first congruence the corresponding parts of the second one, we have the following result:

$$2(a - b) = \sin a - \sin b \Leftrightarrow a - b = \sin\frac{a-b}{2}\cos\frac{a+b}{2}.$$

Since $\left|\sin\frac{a-b}{2} \leq \frac{|a-b|}{2}\right|$ and $\left|\cos\frac{a+b}{2}\right| \leq 1$,

we obtain a contradictory inequation from the last congruence: $|a-b| \leq \frac{|a-b|}{2}$.

That's why the system has no other solutions.

Answer: $(\pi n, \pi n), n \in Z$.

Resume. The article deals with one of the most interesting methods of solving systems of equations named **'Method of reduction to a confluent equation'** and shows how it works. The perspective of the further work is studying other methods of solving systems of equations.

LIST OF REFERENCES

1. Gaishtut O.G., Litvinenko G. M. Solving algebraic questions. – К.: Rad.sch. , 1991.
2. Voronyy O. M. Let’s prepare for academic competition in mathematics. Second book. – Kh.: «Osnova», 2008. – 141 p.