ACTUAL PROBLEMS OF MODERN SCIENCE, EDUCATION AND TRAINING

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CONTENTS

MODERN PROBLEMS OF TECHNICAL SCIENCES

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A METHOD OF STUDENT ACTIVATION USING SOFTWARE TOOLS TO DETERMINE THE ROOT SECTION OF A NONLINEAR EQUATION

Yusupov Firnafas,
candidate of technical sciences,
associate professor,
Tashkent Information named
after Mukhammad al-Khwarazmiy
University of technology
Usupov_f@gmail.com

Nafasov Izzatbek Shernafasovich,
senior teacher,
Urgench State University
Nafasov_I@mail.ru

Annotatsiya: Hozirgi vaqtda ta'lim muammolari haqida gapirganda, biz birinchi navbatda shaxsning individualligini nazarda tutamiz. Ta’limni tashkil etishda ta’lim sifati, fundamentalligi, insonparvarligi va uzluksizligi tamoyillariga ustuvor ahamiyat beriladi. Ushbu maqola matematik injiniring, dasturiy injiniring kabi sohalarda talim olayotgan talabalar uchun mo'ljallangan "Dasturlash asoslari" kursining mazmunini mantiqli strukturalangan tizim asosyda modulli yondashuvi tavsiflangan. O'quv mashg'ulotlarida strukturali modulli yondashuvni samarali amalga oshirishga imkon beradigan, o'quv jarayonini kelajakdagi kasbiy faoliyatning kommunikativ ehtiyojlariga maksimal darajada bo'ysundirishga imkon beradigan ba'zi usullar va dasturiy vositalardan foydalanilgan. Strukturalangan modulli yondashuv kasbiy-faoliyat jihatdan belgilangan o’quv birliklarini oqilona tanlash va tizimlashtirish imkonini beradi, o'qitishning moslashuvchanligini, uni o'zgartirish imkoniyatini ta'minlaydi va talabalarning mutaxassisliklarining xilma-xilligini hisobga olishga imkon beradi.

Kalit so‘zlar: o‘quv fani, tahlil, mantiqli struktura, graf sxema, modul, o‘quv jarayoni, dasturiy vosita, samaradorlik.

Аннотация: В настоящее время, когда мы говорим о проблемах образования, мы прежде всего имеем в виду индивидуальность человека. В организации образования приоритет отдается принципам качества, фундаментальности, гуманности и непрерывности образования. В данной статье описан модульный подход к содержанию курса «Основы программирования», предназначенного для студентов, обучающихся по таким направлениям, как математическая инженерия и разработка программного обеспечения, на основе логически структурированной системы. На учебных занятиях использовались некоторые методы и программные средства, что позволило эффективно реализовать структурированный модульный подход, позволивший максимально

подчинить процесс обучения коммуникативным потребностям будущей профессиональной деятельности. Структурно-модульный подход позволяет осуществлять рациональный отбор и систематизацию профессионально обусловленных образовательных единиц, обеспечивает гибкость обучения, возможность его изменения, позволяет учитывать многообразие специальностей студентов.

Ключевые слова: педагогика, анализ, логическая структура, графовая схема, модуль, образовательный процесс, программный инструмент, эффективность.

Abstract: When we talk about educational problems at this time, we primarily mean the individuality of the individual. In the organization of education, priority is given to the principles of quality, fundamentalism, humanism and continuity of Education. This article describes the modular approach of the content of the course "fundamentals of programming", designed for students studying in such areas as mathematical engineering, software engineering, in the framework of a logically structured system. In training, some methods and software tools have been used that allow you to effectively implement a structured modular approach, to maximize the subordination of the educational process to the communicative needs of future professional activities. The structured modular approach makes it possible to wisely select and systematize professionally-operationally defined units of study, ensures the flexibility of teaching, the possibility of changing it, and allows you to take into account the diversity of student specialties.

Keywords: educational science, analysis, logical structure, graph scheme, module, educational process, software tool, efficiency.

Introduction: One of the pressing problems in the conditions of the modernization of education in higher educational institutions that build the foundation of an informed society is the formation of the development and improvement of professional communicative competencies in several areas of training, the goals of such courses as "Information technology, programming fundamentals" intended for students. One way to solve methodological problems associated with the characteristics of the course consists in structuring the composition of science on the basis of the principles of logic. Based on modular concepts, which are associated with the development of the educational process, personality-oriented and active-pragmatic approaches, demand at all stages of vocational education is increasing and is reflected in many scientific and pedagogical works. [1],[10].

As a result of the active development of computer technology, the process of digitization in all areas of the halq economy is gaining momentum in snapshots. In the Chunonchi talim system, taking into account the individual abilities of each student when setting training goals, organizing the educational process on the basis of a differentiated approach is one of the effective ways to achieve the goal. This can be explained by the fact that not all students can equally master the material presented by the teacher. Therefore, we find the content of educational material very convenient for students to effectively absorb educational material, in the form of a linear graph scheme, giving material in certain parts that are struturized and interconnected taking into account the degree of difficulty.

We consider it advisable to organize the course of the lesson by preparing the educational material in the form of structured learning elements, logically interconnected through the principles of decomposition. In the process of mastering the new material of students, the presence of specially developed software agents (tools), which include consultation between the student and the teacher in case of difficulties between participants in the educational process, is the same period; at the same time, it is necessary for the teacher to make timely adjustments to the student's educational activities in order to avoid serious mistakes. The content of the subject to be mastered can be significantly increased in expressiveness, comprehensiveness, efficiency of the educational process using software agents based on logically structured modules.

All teachers of secondary educational institutions, including professors of the higher education system, solve three main tasks at the same time when conducting classes:

- ensure effective assimilation of a large amount of knowledge on the subject being studied;
- formation of the foundations of holistic systematic thinking on this course in the student;
- contribute to the mental development of students in professional activities.

The level of effectiveness of the educational process activity largely depends on the teacher's ability to control the attention of students, and it is necessary to teach them the principles of mastering effective planning on the basis of structured methods of their own attention. [5],[8].

Despite the large amount of scientific and theoretical and practical work devoted to the problem of developing educational skills, a number of aspects of this problem have not been studied. The description of subject skills and educational-cognitive skills is not clearly distinguished, the conditions for the systematic formation of the ability of their students to structure the structure of educational material are not sufficiently specified, indicative signs that should be based on methods of semantic processing of educational material are practically not identified and their implementation is not well revealed. [8],[10].

Scientists from the countries of the Commonwealth of independent states, such as V.Bespalko, T.Boronenko, B.Gershunskiy, S.N.Grinchuk, A.O.Karelin, V.V.Laptev, Ye.Mashbis, I.Robert, N.Yu.Severova, N.Talizina, O.V.Tarasyuk, Ye.K.Xenner, studied the issues of introducing computerized information technologies into pedagogical and psychological spheres, using pedagogical technologies in improving student educational and cognitive activities, and structuring the design of educational courses based on modern information technologies. And the methodology for teaching subjects on the basis of structured modules was studied by V.Alekseev, D.Vasenkov, N.Dobrovolskaya, Yu.Kolsov, V.Terexov, I.Yasinskiy.

In our republic, such as A.Abduqodirov, N.Azizxo‘jaeva, M.Aripov, F.Zakirova, X.Ibragimov, M.Lutfullaev, U.Nishonaliev, N.Taylaqov, A.Xayitov, R.Hamdamov, U.Yuldashev conducted scientific research on the issues of teaching Informatics, informatization of the higher education system, creation of electronic textbooks, Organization of Distance Education, use of web technologies in the preparation of future educators.

However, in higher educational institutions, the methodological aspects of structuring the content of the subject of programming fundamentals on the basis of clear methodological, logical criteria and teaching on the basis of computerized technologies, organizing and activating the educational process have not been specially studied. This made it necessary to carry out special research on the development of a methodology for activating students using software agents based on the systematization of structured modules, the content of the science of programming fundamentals.

Methodology. A methodology for visualizing the subject of approximate determination of the roots of a nonlinear equation in the form of elements separated into logical partitions (concepts) is considered using the decompositional method. [6].

Subject: A structured logical scheme for determining the cross-section (interval) where the roots of the nonlinear equation lie can be imagined as follows. (Figure 1).

1. Determining the roots of a nonlinear equation, general considerations.

A given equation $f(x)=0$ has a root if the function $f(x)$ changes its sign in any chosen interval $x\in[A,B]$ divided into p equal parts, that is, from negative to positive or from positive to negative (Fig. 2). The functions $f_1(x)$ and $f_2(x)$ in Figure 2 have changed sign on the interval $x\in[A,B]$, that is, they have crossed the *0x*-axis in the section shaded in red. The functions $f_3(x)$ and $f_4(x)$ in Figure 1 did not change sign in the interval $x\in[A,B]$, that is, did not cross the *0x*-axis, which means that the equation does not have a solution in the desired interval. such issues belong to the category of mini-max issues.

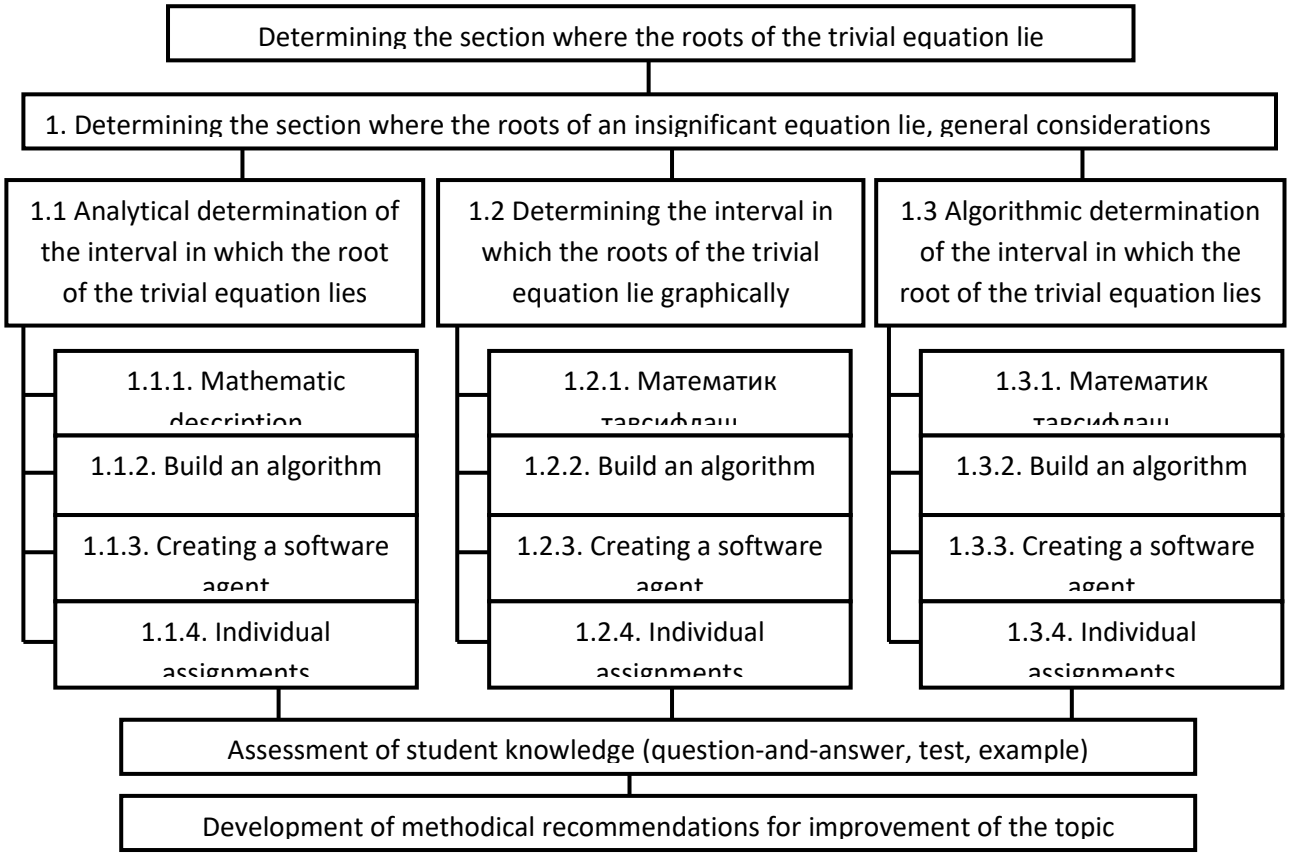

Figure 1. A structured logical scheme of the topic

We will consider analytical, graphical and algorithmic methods of determining the interval where the roots of a nonlinear equation lie.

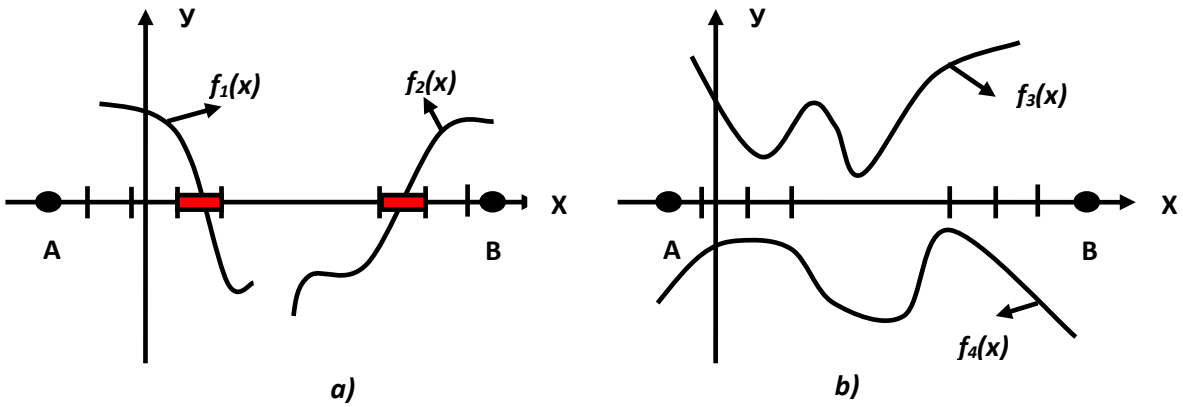

Figure 2. Description of the roots of the nonlinear equation

1.1. Analytical determination of the interval in which the roots of the nonlinear equation lie

1.1.1 Mathematical description. Suppose we are given a nonlinear equation $5^x - 6x - 3 = 0$. To do this, we find the first-order derivative of the function $f(x) = 5^x - 6x - 3$ and determine the value of the critical points by setting $f'(x) = 0$ equal to zero:

$$5^x \ln 5 - 6 = 0,\ 5^x = \frac{6}{\ln 5},\ x\ln 5 = \ln 6 - \ln(\ln 5),\ x = \frac{\ln 6 - \ln(\ln 5)}{\ln 5},\ x \approx 0{,}82.$$

We make a table of signs of the function $f(x)$ at or near the critical point of the argument and in the boundary areas of the argument (Table 1):

Table 1. function pointer table

x	$-\infty$	***1***	$+\infty$
Sign f(x)	+	-	+

$$5^{-\infty} - 6(-\infty) - 3 > 0,\quad 5^1 - 6(1) - 3 < 0,\quad 5^{+\infty} - 6(+\infty) - 3 > 0,$$

According to Table 1, $f(x)$ changes the sign of the function 2 times. Therefore, the function $f(x)$ has two real roots (that is, the function $f(x)$ crosses the *0x*-axis twice), in the intervals $x_1 \in [-\infty;1]$ and $x_2 \in [1;+\infty]$. Now we reduce the intervals in which the roots of the equation lie and make a table of signs around the critical points of the $f(x)$ function (Table 2):

Table 2. Function pointer table

x	***-1***	***0***	***1***	***2***
Sign f(x)	+	-	-	+

the intervals on which the roots of the equation lie are $x_1 \in [-1;0]$ and $x_2 \in [1;2]$.

1.1.2. Algorithm for analytically determining the interval where the roots of a nonlinear equation lie. By shifting the point *x* = 1 to the right and to the left by small steps *h*=1 (the value of *h* can be taken as small as desired), we determine the change of

signs of the function, as a result, the small interval(s) in which the root lies are determined (Fig. 3). Creating software is assigned to students as an independent work.

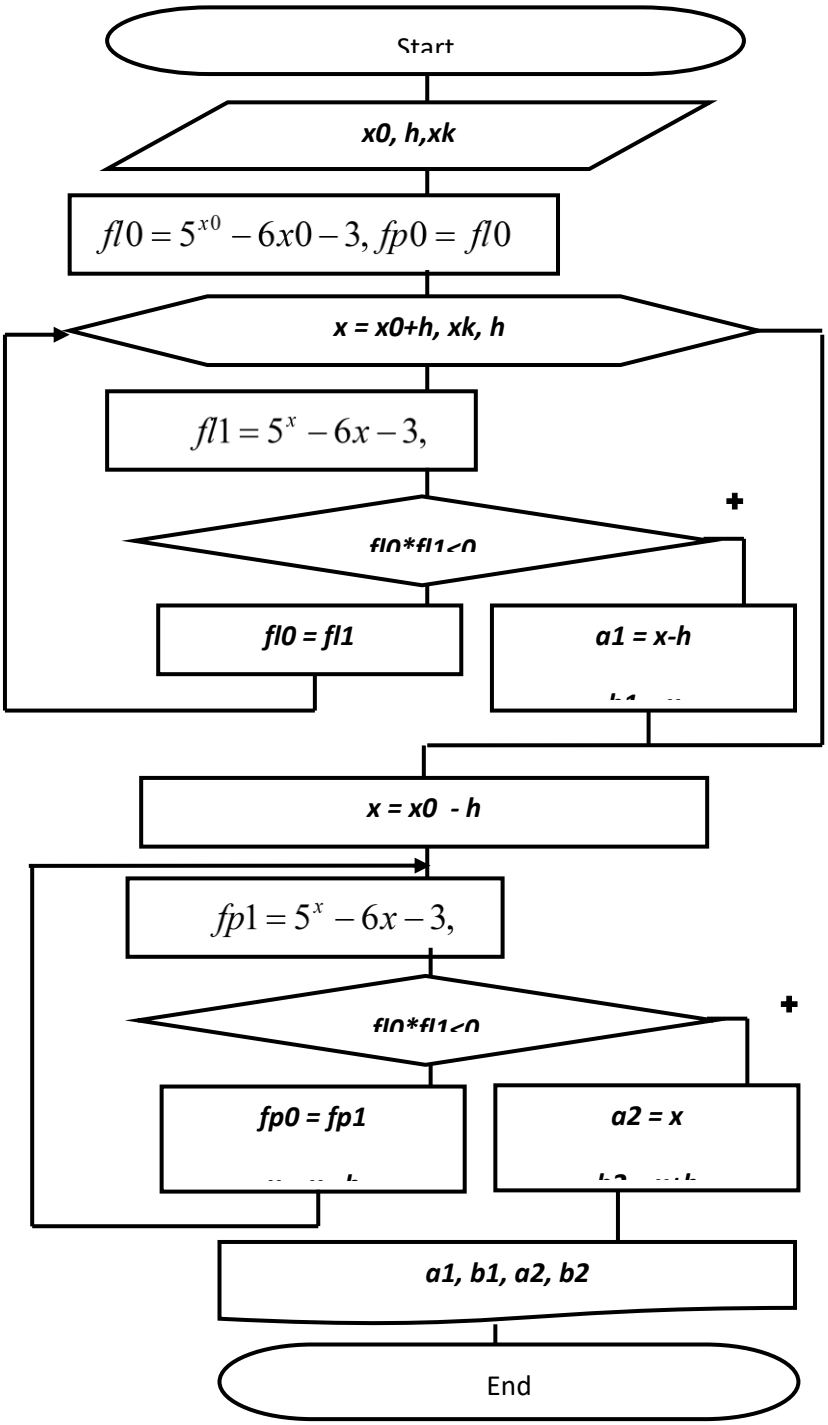

Figure 3. Algorithm for determining the root interval analytically

1.1.3 The result obtained using the software:

```
x0    h    xk = 1 1 5

a1 = 1.0000    b1 = 2.0000
a2 = -1.0000    b2 = 0.0000
```

If we further reduce the value of the argument of the function to h=0.6, we get the following result:

```
x0    h    xk = 1 0.6 5

a1 = 1.0000    b1 = 1.6000
a2 = -0.8000    b2 = -0.2000
```

1.2. Determining the interval in which the roots of a nonlinear equation lie graphically.

1.2.1. Mathematical description. We graphically determine the interval in which the roots of this $5\sin(x)-x^2-3$ nonlinear equation lie. Let's make the equation look like $5\sin(x)=x^2-3$.

Let's determine: $y_1=5\sin(x)$, $y_2=x^2-3$ and we will build the algorithm and program for making the graph of these functions on the computer screen.

1.2.2. We chose the algorithmic language C# to make the graph of the function. Algorithm for making a graph of functions on a computer screen:

1. The graphical mode of the C# algorithmic language is initialized;

2. The background, color of the screen and the color of the *0x* and *0u* coordinate axes to be drawn are selected, for example, making a graph of a function with white color on a black background or black color on a white background;

3. The scale of the *0x* and *0u* coordinate axes is selected, the *0x* and *0u* axes are defined with a section equal to one unit*;*

4. The limit value of the argument is chosen for creating functions, $x\in[a;b]$;

5. $x\in[a;b]$ is a graph of functions with one *h* step;

6. From the computer screen, the value of the intervals of the roots is determined by the points of intersection of the functions.

Paragraphs 1, 2, 3 of the algorithm are explained in the practical lesson. Here is a block diagram of the function graphing part.

The quantities *hx* and *hy* in the algorithm are scales that increase the value of the argument *x* and the function *y*, for example, *hx=30, hy=20* pixels. *X0* and *Y0* are the center of the coordinate plane on the monitor.

1.3.3 The result obtained by the program:

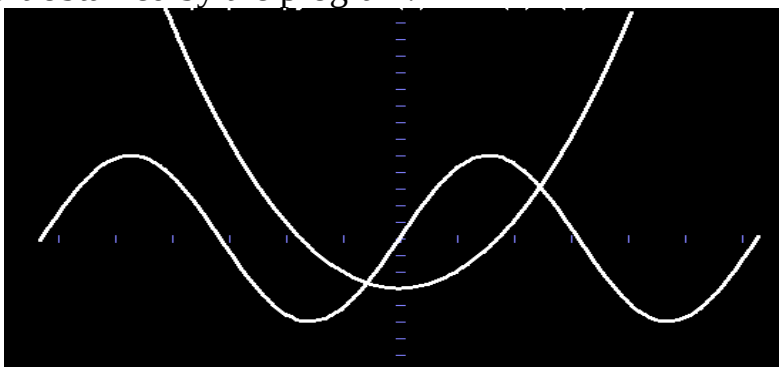

Figure 4. $y_1=5\sin(x)$, $y_2=x^2-3$ is the graph of functions.

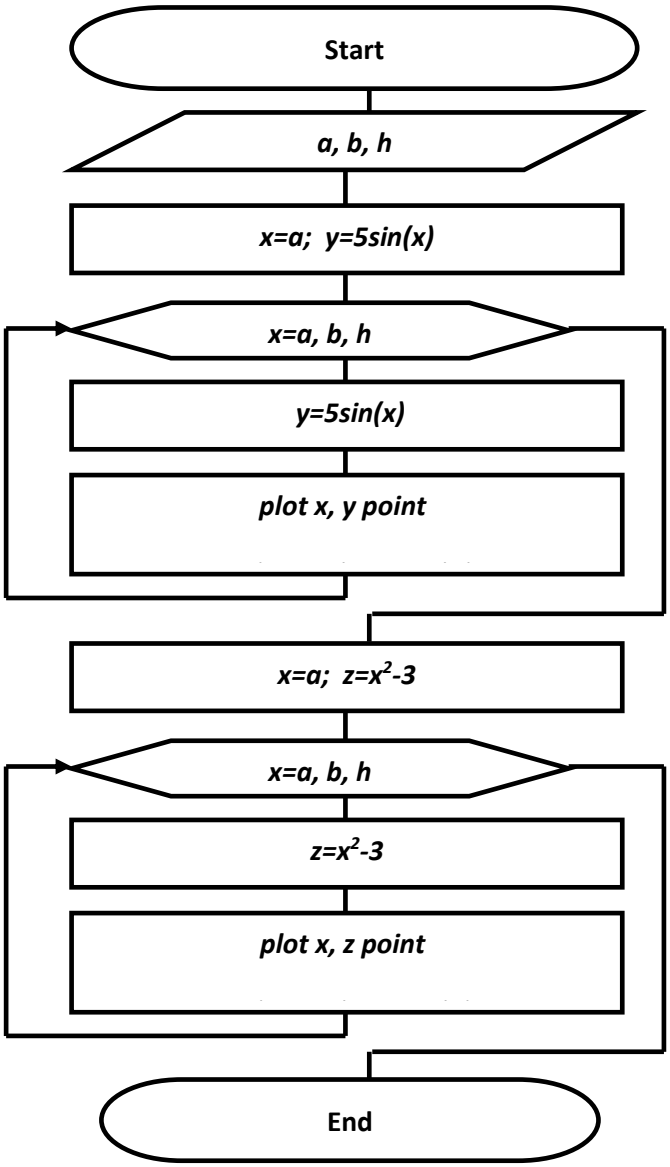

Figure 5. Algorithm for determining the root section graphically

In Figure 4, the amount of the small section on the *0x* and *0u* axis represents one unit. The first intersection of the functions in the searched interval is in the interval, and the second intersection is in the interval. So, $x_1 \in [-1;0]$ and $x_2 \in [2;3]$.

1.4. Algorithmic separation of the cross section where the roots of the equation lie.

Let us say $5\sin(x) - x^2 - 3$. We search for the roots of the function in the section $x \in [A;B]$, taken to a certain extent, with a step *h* as follows.

1.4.1. Mathematical description:

1. The numerical values of the quantities A, V and h are selected;

3. we calculate the value of the function at point "A", $y = f(A)$;

4. An iteration is organized, which ensures that the value of the argument changes from A to V by steps h;

5. We calculate the value of the function at the point corresponding to the "x" argument, $z = f(x)$;

9. The value of the function corresponding to the changed state is used for further calculations, i.e. $y = z$;

10. Repetitions will continue.

A variant of the above-mentioned algorithm in the form of a block diagram is depicted in Fig. 6.

1.4.3. Compilation of the program is assigned to students as an independent work. The result obtained using the program.

```
   a,b,h = -5 7 1

a1 =  -1.000000   b1 =   0.000000   y =  -2.207355   z =   3.000000
a1 =   2.000000   b1 =   3.000000   y =   3.546487   z =  -5.294400
```

To verify the correct operation of the program, test samples are created and the correct operation of the program is verified in practice. As a result, the program development and testing process is completed.

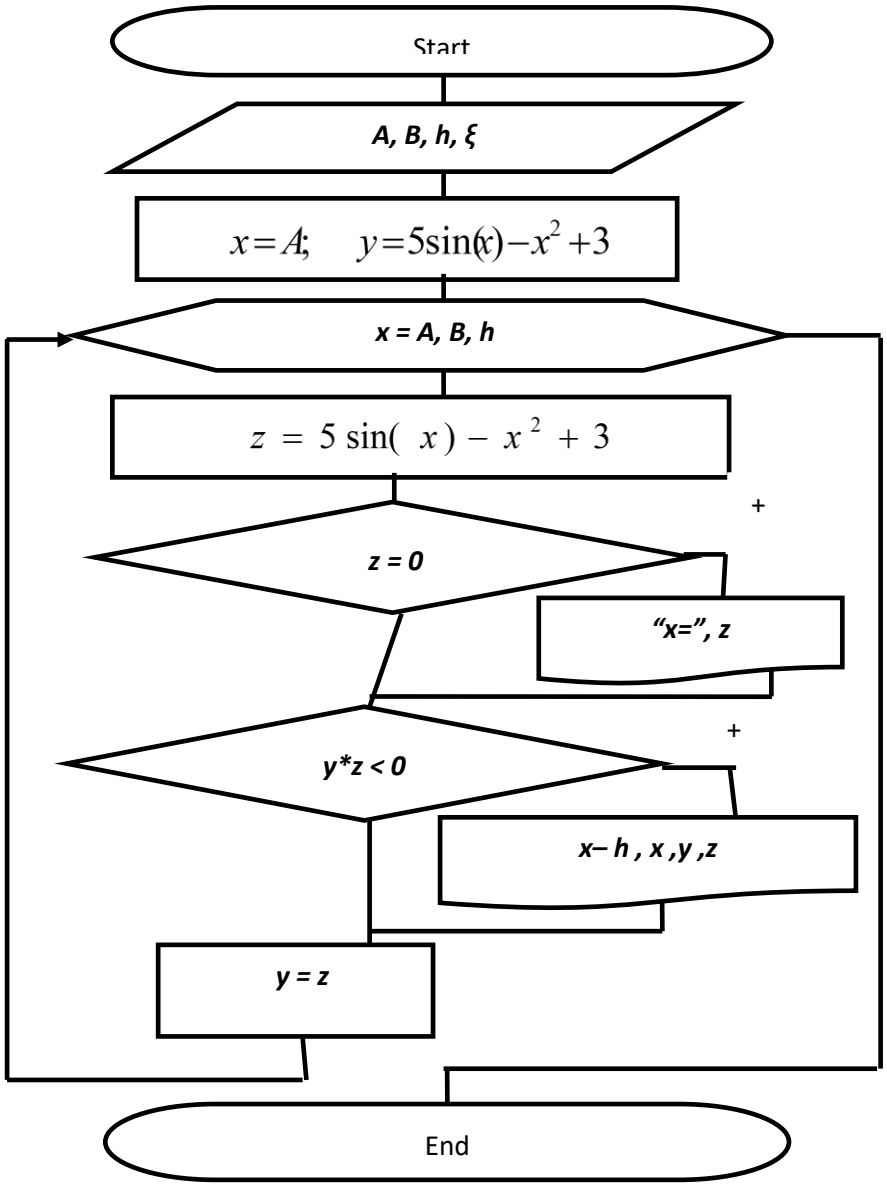

Figure 6. Algorithm for algorithmic determination of root section

1.5. Individual assignments are given to students. Examples of assignments:

Assignment. Using analytical, graphical and algorithmic methods, isolate the cross section where the roots of the equation lie.

1. $5\sin(x)-x^2=-3$	4. $x^3-2x^2+5x-3=0$	7. $5\lg(0.6x+0.2)=x^2$
2. $7\cos(x)-2x^2=8$	5. $x^2-4x-12=-3$	8. $x-6\sin(x)=2.5$
3. $x-\sin(x)=0.75$	6. $x^3-3x^2+x+4=0$	9. $\sqrt{x+0.24}=6\cos(0.42x)$

Students' knowledge will be evaluated.

Conclusions: Conducting lessons using modern methods on the basis of materials organized in the form of logically structured semantic graphs of the "Methods of approximate calculation of the roots of nonlinear equation" section of the science of programming fundamentals accelerates the process of independent learning among students, as a result, the effectiveness of the educational process increases.

Systematizing the content of the educational material, explaining science based on modern technologies (lecture, practical, experience), organizing the content and essence of the subject in a dialogic, individual way using software tools, in the form of a teacher-student, saving time, learning improving the effectiveness of the educational process, developing optimal methods and methods of teaching material.

Experience shows that a modular approach to the logical structure of the content of the "Basics of Programming" course allows for the rational selection and systematization of didactic units included in it, as well as timely control of their acquisition. Teaching with structured modular technology elements helps to organize the educational process more effectively, increases the quality of mastering theoretical and practical materials of professional orientation, and helps to form professional and communicative competence of students.

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PROBLEMS OF USING NEURAL NETWORKS TO ASSESS STUDENT'S KNOWLEDGE

Yusupov Davronbek Firnafasovich
The first vice-rector of
Urganch State Pedagogical Institute
for work with youth and
spiritual and educational affairs
ydavron@mail.ru

Annotatsiya: Oliy ta’lim tizimida talabalar bilimini baholash o‘quv jarayonining ajralmas jihati bo‘lib, ta’lim strategiyasini yo‘naltiruvchi va ta’lim natijalarini shakllantiruvchi sanaladi. An'anaviy baholash usullari talabalar faoliyatini tushunish uchun asos yaratdi, ammo rivojlanayotgan texnologik yutuqlar ushbu amaliyotni yaxshilash uchun yangi yondashuvlarni ishlab chiqarishni taqozo etmoqda.