THEME: APPLICATION OF DIFFERENTIAL EQUATIONS IN DIFFERENT FIELDS

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Abstract. Differential equations are widely used in every aspect of our life. For example: in economics, physics, engineering, while serving as a basis for building scientific developments, it is functionally used in modeling real processes, which is very important for the technological development of modern chemistry, medicine and other industries. In this sense, differentiation is widely used in practice. For example, the results of chemical reactions, laws of decomposition of substances, trends of genetic change, calculation of the company's main income, dynamics of current power over time, demographic situations in a certain region, etc., are modeled using differential equations. Learning to solve differential equations is relevant to learning about problems and shortcomings in the above fields.

Keywords: Function, differential calculus, modeling, preparation, wave equation, evolution, dynamics, accelerator norm.

Enter. Differential calculus is a branch of mathematics that deals with the calculation of derivatives and differentials, the study of their properties, and their application to the verification of functions . By the 17th century , due to the growth of production forces in Europe , the creation of various machines and structures, the development of shipbuilding, the requirements of ballistics (in general, military work) put a lot of new problems before the exact sciences, including mathematics, the ideas of differential calculus and integral calculus arose.

René Descartes and other mathematicians in solving the problem of trying to curve . Isaac Newton and Gottfried Leibniz completed the work of their predecessors in this area. In the late 17th and early 18th centuries, mathematical analysis was formed as an independent science.

The main part. The "Differential Equations" branch of mathematics is one of the largest branches of modern mathematics. It intersects with many fields of activity. It is known that a differential equation is an equation containing unknown functions under the sign of derivative or differential. Such equations serve as a basis for building scientific developments and are functionally used in modeling real processes, which is very important for the technological development of modern chemistry, medicine and other industries. In this sense, differential equations are widely used in practice. For example, the result of chemical reactions, laws of decomposition of substances, trends of genetic change, calculation of the company's main income, dynamics of current power over time, demographic situations in a certain region, etc., are modeled and calculated using differential equations. Mathematical methods based on differential equations are used in many fields, including chemistry and

medicine. Every year, scientists discover more and more new diseases, find medicines, new procedures and methods of treatment.

Now we will consider the application of differential equations in various fields.

In medicine, the law of dissolution of substance forms in tablets is determined by the equation dn/dt=-kn (1). Here k is the dissolution rate constant. The minus sign in the equation means that the number of forms of matter decreases over time. [1,2,3]

If we solve relation (1) using differential equations, we can find out how long the drug will dissolve in the body.

The breakdown of the drug in the human body is determined using the differential equation dN/dt=kn. Here N is the amount of the drug at any time. The rate of change of the amount of the drug is proportional to the amount of the drug at a certain time [4,5].

So, in order to know the decomposition of a simple drug, it is necessary to know how to solve differential equations. If we see the importance of the differential equation in another field of medicine, today the "Prey-prey" model is used in the treatment of oncological diseases.

$dx / dt = a_1 x - b_1 xy$

d $y / dt = - a_2 x - b_2 x$ is solved using this system.

Here a_1, a_2, b_1, b_2 are coefficients (model parameters)

x is the number of tumor cells,

y is the number of lymphocyte cells,

dx / dy is the rate of change in the number of tumor cells. By solving this system of equations, it is possible to study the laws of health status change [6,7].

We have seen how important differential equations are in medicine . Now let's get acquainted with the importance of this in mechanics.

English mathematician Ian Stewart in his book " 17 equations that changed the world " (Ian Stewart, " 17 equations that changed the world " - London, 2012), the 17 most important mathematicians in the history of science talks about the history of the discovery of equations and their practical importance for mankind [8].

$\partial^2 u / \partial t^2 = c^2 * \partial^2 u / \partial x^2$ (2) is the wave equation. Its importance in our life is very great. The solution of this equation helps us in predicting earthquakes, predicting the risk of tsunami in the oceans, geological exploration, searching for underground minerals, deposits of oil, gas, etc., analyzing the properties of sound waves returned from the mine, and thereby about the geological and economic importance of the mine. helps to conclude.

Let's look at examples of the application of the theory of differential equations in models of economic processes, where t-time is involved as an independent variable. Such models are useful in examining the evolution of economic systems over a long period of time, they form the basis of the analysis of economic dynamics.

Let's consider the model of natural growth of production:

Suppose that some product is sold at a price p, and if we say that the function Q(t) indicates the change in the quantity of the product produced during time t, then a profit equal to pQ(t) will be obtained during the time. Let's say that a part of the received income is spent on production investment, i.e. I(t)=mpQ(t) (4)

m is the investment norm, a constant number and $0 < m < 1$ [9].

Now let's work the equation by entering various conditions.

If the market starts from the assumption that there is enough supply and the production is fully sold, the production rate will increase (accelerator) again. And the speed of production is proportional to the growth of investment, i.e

Q ’ = l I(t) (5) here, l -accelerator norm [9].

we get Q' = kQ, k = l mp (6).

(6) is an equation in which the variables of the differential equation are separated. The form of the general solution of this equation is $Q = Ce^{kt}$, where S is an arbitrary constant number [9]

To solve this equation, you need to know how to solve an equation with separable variables.

Summary. Based on the article, it can be concluded that when we move to each section of mathematics, we come across new, interesting information, and it depends on the skill of the teacher to deliver them to the students in a more interesting and understandable way. It is a complex process to explain differential equations in relation to life, to convey its specific features to the student. This article presents ways to explain these cases in a complete and understandable way. It is mentioned as necessary in medicine, mechanics and every aspect of economy. Therefore, knowing these cases will greatly help students to increase their interest in this topic and to find solutions to the questions they have been struggling with in this topic.

References:

1. Maksudov V.G. Study of harmonic vibrations based on innovative technologies ("Case-study", "Assessment", "Venn diagram" as an example). - Tashkent, Modern education. No. 7., 2017. 11-16 p . https://scholar.google.com/citations?view_op=view_citation&hl=ru&user=GGgl544AAAAJ&citation_for_view=GGgl544AAAAJ:L8Ckcad2t8MC

2. Yakhaboev R., Yakhaboeva D., Ermetov E., Bazarbaev M.. The development model of graphic object recognition and the basic method of "Transfer learning" for diagnostics in the sphere of health. - Tashkent: 2023. #3. https://scholar.google.com/citations?view_op=view_citation&hl=ru&user=YkyMhGQAAAAJ&citation_for_view=YkyMhGQAAAAJ:SeFeTyx0c_EC

3. Maksudov VG Technology of organization of modern lecture classes in higher education institutions. England: Modern views and research - 2021. 160-166 pp. https://scholar.google.com/citations?view_op=view_citation&hl=ru&user=GGgl544AAAAJ&sortby=pubdate&citation_for_view=GGgl544AAAAJ:IWHjjKO FINEC

4. Maksudov VG Technology of lecture organization in modern education.- Washington, USA, Collations of scientific works. 2021. 160-163 pp. https://scholar.google.com/citations?view_op=view_citation&hl=ru&user=GGgl544AAAAJ&sortby=pubdate&citation_for_view=GGgl544AAAAJ:qUcmZB5y_30C

5. Maksudov VG The use of distance learning technologies in the creation of e-learning courses in higher education by professors and teachers of higher education institutions. Study guide. – Tashkent, 2021. Pp 256. https://scholar.google.com/citations?view_op=view_citation&hl=ru&user=GGgl544AAAAJ&citation_for_view=GGgl544AAAAJ:LPZeul_q3PIC

6. Makhsudov VG Once again about problems in physics. – Austria, Vienna: European journal of education and applied psychology, #2. pp. 17-25. https://scholar.google.com/citations?view_op=view_citation&hl=ru&user=GGgl544AAAAJ&citation_for_view=GGgl544AAAAJ:g5m5HwL7SMYC
7. Maksudov VG Integration of theoretical and practical knowledge in laboratory training. - Tashkent: Pedagogy, 2016. #6. - B. 84-88. https://scholar.google.com/citations?view_op=view_citation&hl=ru&user=GGgl544AAAAJ&citation_for_view=GGgl544AAAAJ:dTyEYWd-f8wC
8. ORBITA.UZ
9. "Mathematics for economists" (textbook). Sharahmetov Sh., Naimjonov A. T : "Science and technology", 2007..