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# NEWTON-LEIBNITZ FORMULA

***Ro'ziyev Jamshid Xudoyberdiyevich***
*The senior teacher of Academic Lyceum No.1*
*Tashkent State University of Economics*

**Abstract**. Newton's contribution to the development and development of the sciences of mathematics and geometry is considered significant. In this article, we will analyze another one of Newton's formulas, which provide solutions to many problems with their laws and formulas. This time the Newton-Leibnitz formula will be analyzed in detail.

**Keywords**: mathematical properties, Newton-Leibnitz formula, fractional numbers, fractions, calculation techniques, etc.

Concept of model is important in practical applications of mathematics. When studying a process, event or object, a person always uses its model in one form or another. For example, the Earth is its model, a globe, and various machines and devices can be represented using their models. The concept of a model is very broad and has different meanings. In particular, it can be defined as follows.

Newton-Leibnitz formula. It can be seen from the previous results that the problem of finding the exact integral through its definition, that is, the limit of the integral sum, is solved with great difficulty even in the case of a simple function y=x. Therefore, the problem of finding a more convenient and easier way to calculate the exact integral arises. This problem is solved by the Newton-Leibnitz formula, which is the main formula of integral calculus. Let y=f(x) be a continuous function on some section [a,b]. Then y=f(x) is a function that is integrable on the section [a,b]. From here for arbitrary x[a,b].

$$\Phi(x) = \int_a^x f(t)dt \quad (2)$$

it follows that there is a definite integral. In this case, if the lower limit a is considered constant, and the upper limit x is considered variable, then equality (2) represents a function F(x) defined on the section [a,b], and the upper limit is called the variable integral. This function has the following important feature, which represents a deep connection between differential and integral calculus.

Indefinite and definite integral concepts were introduced independently of each other. We remind that the indefinite integral f(x) is included as the class of initial functions of the function, and the definite integral is included as the limit of integral sums of the function f(x) over the section [a,b]. But in order to show that there is a close connection between these two concepts and that it is not for nothing that they are both called "integral", we conditionally write the Newton-Leibnitz formula as follows:

$$\int_a^b f(x)dx = F(b) - F(a) = F(x)\Big|_a^b = [F(x)+C]_a^b = \int f(x)dx\,\Big|_a^b$$

So, in order to calculate the definite integral according to the Newton-Leibnitz formula, we first "forget" its limits, consider and calculate it like an indefinite integral. Then, "remembering" that there are limits, we put the values of the upper limit b and the lower limit a instead of x in the calculated expression of the indefinite integral. We find the value of the given exact integral by taking the difference of the resulting numbers. In this case, we can ignore the arbitrary constant number C in the answer of the indefinite integral. Thus, the problem of calculating the definite integral through the Newton-Leibnitz formula is reduced to the problem of calculating the indefinite integral we are familiar with.

Newton Leibniz Theorem provides the formula for the differentiation of a definite integral whose limits are functions of the differential variable. This is also known as differentiation under the integral sign. Differentiation and integration are important topics for the JEE Main exam. Using Newton Leibniz Theorem, students can easily solve questions on the differentiation of a definite integral when limits are functions of the differential variable. Differentiation and integration play a very important part in the mathematical studies of higher-order. And, in their very concept, they cover a very large basis for their varied applicability. The method of Newton-Leibnitz is used to solve the definite integrals, but of higher difficulties, the ones in which the limit for the integral in itself is a differential variable. To solve such kinds of problems, a different set of methods is to be used, and we get that type of method from this theorem.

This theorem can be used in the concepts of both integrations as well as differentiation. On the part of differentiation, it can be used to find the differential of a function to first order, second-order, and even to the nth order. Also, the concept of integration regarding this theorem is already known. There are different sets of formulas that are used to solve the integrals for the functions in questions. And that happens to be the reason why so many properties of the integrals are introduced. However, the normal properties of definite integrals do not apply to the problems in which the limit of integration is a function of a differential variable. Hence, this theorem is needed to solve the problems.

**References**:


1. Howard Anton, Chris Rorres. Elementary Linear Algebra: Applications Version, 10th. – USA: Lehigh University, John Wiley & Sons, 2010. – 1276 p.
2. Ion Goian, Raisa Grigor, Vasile Marin, Florentin Smarandache. Algebraic problems and exercises for high school. – USA: The Educational Publisher Columbus, 2015. – 146 p.
3. Jabborov N.M. Oliy matematika va uning tatbiqlariga doir masalalar to„plami. 1,2-qism. 2014.
4. Karimov M. Oliy matematika. O„quv qo„llanma (1-qism). – T.: IqtisodMoliya, 2005. – 110 b.
5. Karimov M. Oliy matematika. O„quv qo„llanma (2-qism). – T.: IqtisodMoliya, 2006. – 125 b.
6. Konev V.V. Limits of Sequences and Functions. Textbook. The second edition. Tomsk. TPU Press, 2009.