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EASY PROOF OF PRIMARY LIMITS IN PRIVATE SCHOOLS

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Abstract
In this article, it is written about the proof and origin of the "Wonderful and important limits", which students of higher education institutions use and study to find the limits of functions in the science of mathematical analysis.

Keywords: limit, Lopital's rule, derivative, function, derivative of a complex function, change of form.

Introduction

After the independence of our country, as in all fields, important reforms are being implemented in the field of education. The main goal of these reforms is to improve the field of education in our country in accordance with the requirements of the time; training of knowledgeable and qualified specialists. In recent years, drastic changes in the field of science and technology of the world have shown that important changes should be made in the field of education in our republic, and therefore in 2020, a new version of the Law "On Education" was adopted. The adopted Law "On Education" took into account that all educational institutions, as well as newly established specialized schools and academic lyceums, should be rich in the content of the mathematics course and its practical applications.

On January 28, 2022, at the meeting of the video selector on the development of school education, chaired by President Shavkat Mirziyoyev, the head of our state said: "Education is our future, a matter of life and death. Therefore, we need a high-quality education system, schools with modern conditions, qualified pedagogues to teach in them, school principals with management and leadership skills," he said.

In addition, the fourth priority direction of the development strategy of New Uzbekistan for 2022-2026, the 5 goals of "100 goals for human dignity" and the 18 tasks in it are all related to non-voting school education. The head of our state stated in his speech that it is related. It is known that in order to become a qualified pedagogue-staff, it is necessary and important for each pedagogue to have deep knowledge, skills and, of course, experience in his field. Especially, mathematics teachers are required to be very experienced. will be done. Because most of the basis of other sciences is the knowledge of mathematics. One such knowledge is limits.

While studying the mathematics course, we come across the concept of limit several times. For example, the limit of a function, the limit of a sequence, etc.

The limit of the sequence is optional ε > 0 so when the number is taken n_0 if there is a natural number, n > n_0 for all natural numbers satisfying the inequality $|x_n - a| < \varepsilon$ if the inequality holds, a is a number $\{x_n\}$ is called the limit of the sequence and $\lim_{n\to\infty} x_n = a$ defined as Each is the limit of the function $\varepsilon > 0$ ditto for thigh $\delta > 0$ number is found

$0 < |x - a| < \delta$ when the inequality holds $|f(x) - A| < \varepsilon$ if the inequality also holds, x argument a when striving for $f(x)$ function limit A is called equal to the number and $\lim_{x\to a} f(x) = A$ defined as $a \ni R$ it is very easy to calculate the limit of the function. For example:

$$\lim_{x\to 2}\frac{9x^2-4x+11}{2x+9} = \frac{9\cdot 2^2 - 4\cdot 2 + 11}{2\cdot 2 + 9} = \frac{39}{13} = 3$$

So, what if the function argument goes to infinity? To calculate this, we perform various permutations on the function or use Lopital's rule:

$$\lim_{x\to\infty}\frac{5x^2+2x-9}{3x^2-8x+6} = \lim_{x\to\infty}\frac{5+\frac{2}{x}-\frac{9}{x^2}}{3-\frac{8}{x}+\frac{6}{x^2}} = \frac{5+\frac{2}{\infty}-\frac{9}{\infty}}{3-\frac{8}{\infty}+\frac{6}{\infty}} = \frac{5}{3}$$

When there are derivatives of some functions $\frac{0}{0}, \frac{\infty}{\infty}, 0\cdot\infty, \infty-\infty,$

$1^\infty, 0^0, \infty^0$ the problem of opening the ambiguities in appearance becomes much easier. Opening ambiguities using derivatives is usually called Lopital's rules.

Lopital's theorem is this - $\frac{0}{0}, \frac{\infty}{\infty}$, va $\frac{a}{0}$ $(a \in R)$ is a method of finding the limits of functions that reveal the indeterminacy of the form. The theorem underlying the method confirms that under certain conditions the limit of the ratio of functions is equal to the limit of the ratio of their derivatives.

When we calculate the limit of some functions, we can observe the state of non-determinism. In such cases, we can work according to Lopital's rule, that is, the derivative is taken from the function. This made it much easier for us to calculate the limit. We also refer to Lopital's rule to prove exceptional limits.

1) $\lim_{x\to 0}\frac{\sin x}{x} = 1$. So, now we consider the proof of this limit.

$$\lim_{x\to 0}\frac{\sin x}{x} = \lim_{x\to 0}\frac{(\sin x)^I}{(x)^I} = \lim_{x\to 0}\frac{\cos x}{1} = \frac{\cos 0}{1} = \frac{1}{1} = 1$$

Let's now consider the proof of several more limits similar to the one we discussed above:

2) $\lim_{n\to\infty}\frac{n}{2^n} = 0$

$$\lim_{n\to\infty}\frac{n}{2^n} = \lim_{n\to\infty}\frac{(n)^I}{(2^n)^I} = \lim_{n\to\infty}\frac{1}{2^n \ln 2} = \frac{1}{2^\infty \ln 2} = 0$$

So, to prove this limit, first take the derivative from it, and then all n lar o`rniga n the desired number ie ∞ as long as we leave this sign and perform arithmetic operations.

3) $\lim_{n\to\infty}\sqrt[n]{a} = 1$

$$\lim_{n\to\infty}\sqrt[n]{a} = \lim_{n\to\infty} a^{\frac{1}{n}} = a^{\frac{1}{\infty}} = a^0 = 1$$

4) $\lim_{n\to\infty}\frac{\log_a n}{n} = 0$

$$\lim_{n\to\infty}\frac{\log_a n}{n}=\lim_{n\to\infty}\frac{(\log_a n)^I}{(n)^I}=\lim_{n\to\infty}\frac{\frac{1}{n}\ln a}{1}=\frac{1}{\infty}\ln a=0$$

5) $\lim_{x\to 0}\frac{\tan x}{x}=1$

$$\lim_{x\to 0}\frac{\tan x}{x}=\lim_{x\to 0}\frac{(\tan x)^I}{(x)^I}=\lim_{x\to 0}\frac{\frac{1}{\cos^2 x}}{1}=\frac{1}{\cos^2 0}=\frac{1}{1}=1$$

6) $\lim_{x\to 0}\frac{\sin ax}{x}=a$

$$\lim_{x\to 0}\frac{\sin ax}{x}=\lim_{x\to 0}\frac{(\sin ax)^I}{(x)^I}=\lim_{x\to 0}\frac{a\cos ax}{1}=\frac{a\cos a\cdot 0}{1}=\frac{a\cdot 1}{1}=a$$

7) $\lim_{x\to 0}\frac{\ln(1+x)}{x}=1$

$$\lim_{x\to 0}\frac{\ln(1+x)}{x}=\lim_{x\to 0}\frac{(\ln(1+x))^I}{(x)^I}=\lim_{x\to 0}\frac{\frac{1}{1+x}}{1}=\frac{\frac{1}{1+0}}{1}=1$$

8) $\lim_{x\to 0}\frac{e^x-1}{x}=1$

$$\lim_{x\to 0}\frac{e^x-1}{x}=\lim_{x\to 0}\frac{(e^x-1)^I}{(x)^I}=\lim_{x\to 0}\frac{e^x}{1}=\frac{e^0}{1}=\frac{1}{1}=1$$

9) $\lim_{x\to 0}\frac{a^x-1}{x}=\ln a$

$$\lim_{x\to 0}\frac{a^x-1}{x}=\lim_{x\to 0}\frac{(a^x-1)^I}{(x)^I}=\lim_{x\to 0}\frac{a^x\ln a}{1}=\frac{a^0\ln a}{1}=\ln a$$

10) $\lim_{x\to 0}\frac{(1+x)^a-1}{x}=a$

$$\lim_{x\to 0}\frac{(1+x)^a-1}{x}=\lim_{x\to 0}\frac{((1+x)^a-1)^I}{(x)^I}=\lim_{x\to 0}\frac{a(1+x)^{a-1}}{1}=$$
$$=\frac{a(1+0)^{a-1}}{1}=\frac{a\cdot 1^{a-1}}{1}=a$$

So, now we know where some amazing and important limits come from. But in order to understand these limits, we need to have basic concepts about the limit and better learn the Laplace theorem. Studying mathematics increases a person's interest in science, the ability to think logically, and affects the mastering of other subjects. At the same time, I would like to mention that it can be a bit difficult to always remember the general formulas of great and important limits, to be able to apply them when necessary. Therefore, learning to derive or prove formulas will help students to remember them.

References:

1. Otaboyev T.O`. Karimov J.A.>va boshq. “Matematik analiz” fani bo`yicha o`quv-uslubiy majmua.(Matematika ta`limy o`nalishi talabalari uchun)-T:Toshkent 2016-yil.
2. B.A.Shoimqulov, T.T.Tuychiyev, D.H.Djumaboyev.Matematik analizdan mustaqil ishlar.(Oliy o`quv yurtlarining bakalavriat ta`limy o`nalishi talabalari uchun uslubiy qo`llanma)-T:”O`zbekiston faylasuflar milliy jamiyati”.Toshkent 2008-yil
3. https://arxiv.uz>Referatlar>Algebra>Lopital qoidasi.
4. https://uz.m.wikipedia.org>Lopital teoremasi.