INNOVATIVE APPROACHES TO TEACHING HIGHER MATHEMATICS TO STUDENTS OF TECHNICAL DIRECTIONS

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Abstract

This article discusses innovative approaches to teaching higher mathematics to students in technical fields. It analyzes the implementation of interactive methods, digital platforms, and practice-oriented tasks to increase students' engagement and develop their professional competencies. Four solved problems are included to illustrate the effectiveness of these innovative methods.

Keywords: higher mathematics, innovative approach, technical education, interactive method, engineering problems.

INTRODUCTION

Today, the transition to modern forms and methods of teaching in the higher education system is becoming increasingly important. Teaching higher mathematics on a practical and interactive basis, especially to students studying in technical fields, has a direct impact on their professional training. Traditional approaches rely only on the student's theoretical knowledge, which may not be sufficient to solve real problems. Therefore, there is a need to update the educational process through innovative approaches.

MAIN PART

1. The concept of an innovative approach and its role in the educational process

An innovative approach is a method of simplifying students' knowledge acquisition, developing their independent thinking and problem-solving skills

through new pedagogical technologies, information media and interactive methods in the educational process.

The following innovative approaches are widely used in teaching higher mathematics to students in technical fields:

- ✓ Simulation and mathematical modeling;
- ✓ Software tools such as GeoGebra, Desmos, Maple;
- ✓ Problem-based learning methodology;
- ✓ Task-based learning;
- ✓ Distance learning platforms (Moodle, Hemis, Zoom, Telegram).

2. Examples solved based on a practical approach

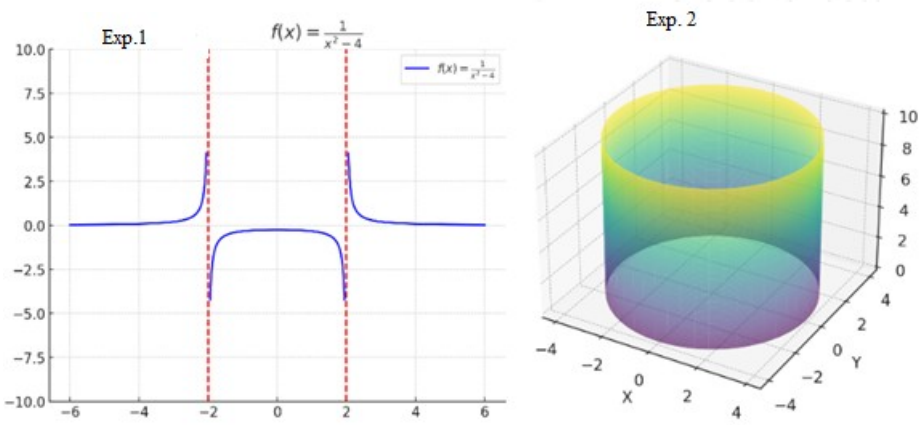
Example 1. (Domain and graph of a graphed function)

Given: $f(x)=\frac{1}{x^2-4}$ Determine the domain and graph of the function.

Solution: The domain of the function: the denominator of the fraction must be non-zero: $x^2-4\neq 0 \Rightarrow x\neq \pm 2$. If we write this in interval form:

$$D(f)=(-\infty,-2)\cup(-2,2)\cup(2,+\infty)$$

Below we draw the graph of this function.



Example 2. If the radius of a cylinder is $r=4$ cm and the height is $h=10$ cm, find its total surface area.

Solution: For this we need the $S=2\pi r(r+h)$ formula. We calculate by putting the values of the parameters in this formula:

$$S=2\pi\cdot 4\cdot(4+10)=8\pi\cdot 14=112\pi\ cm^2$$

So, the surface area of the given cylinder is equal to 112π cm^2.

Now let's draw the graphs of the functions in examples 1 and 2:

Example 3. (Using the determinant in solving problems)

There is a door in a wall 5.15 m wide and 2.78 m high. The door is 2.05 m high and 0.8 m wide. How many pieces of wallpaper without flowers are needed for this wall?

To solve this problem, we will use the second determinant:

Solution:

This wall requires $\begin{vmatrix} 5.15 & 2.05 \\ 0.8 & 2.78 \end{vmatrix} = 5.15 \cdot 2.78 - 2.05 \cdot 0.8 = 14.317 - 1.64 = 12.677$ square footage of wallpaper.

Example 4. How much earthwork is done when digging a pit 3 m deep, 12.5 m wide, and 25 m long?

Solution: We solve the problem using a third-order determinant. Earthwork in the $\begin{vmatrix} 3 & 0 & 0 \\ 0 & 12.5 & 0 \\ 0 & 0 & 25 \end{vmatrix} = 3 \cdot 12.5 \cdot 25 = 937.5$ volume unit (in this example) is done.

So, 937.5 m of soil was excavated when digging the pit.

Example 5. (Finding the derivative using the problem method)

Function: $y = x^3 \cdot \sin x$. Find the derivative (using Leibniz's rule).

Solution: $y' = \frac{d}{dx}(x^3) \cdot \sin x + x^3 \cdot \frac{d}{dx}(\sin x) \Rightarrow y' = 3x^2 \sin x + x^3 \cos x$

RESULT

Based on the analyses and examples conducted in this article, the theoretical and practical importance of higher mathematics, as well as its role in the development of students' thinking, was thoroughly covered. Each problem presented proved how important various sections of higher mathematics (functions and asymptotes, geometry, integral calculus and probability theory) are not only theoretically, but also practically.

In particular, the following results were achieved:

1. By analyzing asymptotic functions, students learn to build mathematical models and understand the behavior of functions at limiting points.

2. Calculating the surfaces of geometric shapes (for example, the surface area of a cylinder) develops spatial thinking skills necessary for specialists in technical fields.

3. Determining the mass worked through integral calculus - this strengthens integration with physics and mechanics and serves to form practical knowledge.

4. Through the application of probability theory and combinatorics, students will be prepared to make accurate decisions on statistical thinking, selection and planning.

Each branch of mathematics is useful in solving real-life problems. This helps students develop mathematical literacy and the skills to systematically solve problem situations. Higher mathematics is not only a source of theoretical knowledge, but also an important foundation for preparing for modern professions.

CONCLUSION

In conclusion, higher mathematics plays a special role in deepening the theoretical knowledge of students of any professional field, developing analytical thinking, and forming innovative approaches to solving problems.

The following are highlighted as the main conclusions:

• In teaching higher mathematics, it is possible to prepare students for real-life situations based on a competency-based approach.

• By enriching each mathematical topic with practical examples, the topics are explained in more depth and student mastery is improved.

• When multidisciplinary integration - that is, when areas such as mathematics and economics, mathematics and mechanics, mathematics and physics are taught together, the importance and necessity of the subject becomes even more evident.

• Higher mathematics is the most convenient and necessary tool for developing independent research, experimentation, and numerical analysis skills in students.

Thus, higher mathematics teaches not only theory, but also the scientific analysis and effective solution of life problems. This is one of the most important factors in training competitive personnel today.

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