

Visualization of analytical geometry problems

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Abstract: Nowadays there is a lot of software for visual solving mathematical problems, but most of the textbooks intended for learning contain only manual solutions of the problems. In this paper we decided to use GeoGebra to solve problems from analytical geometry where it is very important to see visually the process of arriving the solution and what the final solution looks like. So, the visual solutions will be shown in the paper, as well as the steps for obtaining them. For visualization we will use the GeoGebra software.

Keywords—*visualization, analytic geometry, GeoGebra*

Introduction

Analytical geometry problems are studied by students at primary, secondary and university levels, especially those who have chosen to study at a technical faculty. Considering the problems of students in solving such problems, such as difficulties in manually graphically representing the data given in the problem and the solution, as well as uncertainty about whether the solution is correct, we decided to process problems from analytic geometry by visualizing the steps to obtain a solution and the final solution. This issue of several mathematical topics has been developed by several authors. The issue became interesting to us, and that's why we decided to apply it to a mathematical topic for which we noticed that students had problems solving.

Purpose of Study

The main reason for creating this paper was the shortcomings in textbooks on analytical geometry, which lacked a visual representation of the problem and the solution to the task. Another motive for writing was the continuity in weaker knowledge among students of this topic.

Research Methods

The problem with the tasks from analytical geometry will always be present. It will appear in secondary school or faculty. In school and faculty around the world, the problem of solving tasks from analytical geometry became especially popular in the last global pandemic when teaching was online. For the purposes of this paper, tasks from analytic geometry were solved with software GeoGebra in order to determine material for studying analytical geometry with visualization of the steps of solving tasks and visualization of solution of tasks. Then, a comparison is made of literature with and without visualization on this topic, after which conclusions are drawn about the advantages and disadvantages of each type of learning material. Finally, a conclusion is drawn about how it is better to study this topic.

Findings and Results

The paper will consider problems with ellipse, vectors, circle, line, and so on. For all of them, we will have a visual representation with figures of some steps in solving and figure of the final solution of the problems.

Conclusions and Recommendations

Visualization plays an important role in education, especially in the study of mathematical subjects. We demonstrate this attitude in this paper. By visualizing the steps for solving the problems, we achieve a much more interesting, understandable and attractive study of problems in analytic geometry.

References

- [1] Karamazova Gelova, E., Kocaleva, M.: Advantages of Using Geogebra Software when Examining the Flow and Drawing a Graph of a Function, *Pedagogika-Pedagogy*, 2023, 95 (2). pp. 261-275. ISSN 1314-8540 (Online)
- [2] Karamazova Gelova, E., Kocaleva, M., Milanova, B. The role of ICT tools in teaching mathematics. *South East European Journal of Sustainable Development*, 2023, 7 (1). pp. 1-7. ISSN 2545-4471
- [3] Karamazova Gelova, E., Kocaleva, M.: Solving tasks from the topic plane equation using GeoGebra. *Balkan Journal of Applied Mathematics and Informatics*, 2022, 5 (2). pp. 17-25. ISSN 2545-4803
- [4] Karamazova Gelova, E., Kocaleva, M.: The importance of IT technologies in education in pandemic time. *South East European Journal of Sustainable Development*, 2022, 6 (3). pp. 36-41. ISSN 2545-4463
- [5] Trifunov, Z., Jusufi Zenku, T., et. al.: Importance of Visualization in Math Problems at the Universities, *South East European Journal of Sustainable Development*, 2019, 3 (1). pp. 17-23. ISSN 2545-4463
- [6] Trifunov, Z., Karamazova Gelova, E.: Visualization of discrete random variables. *Proceedings of the V Congress of mathematicians of Macedonia*, 2014, pp. 108-116. ISSN 978-9989-646-69-0