NON-STANDARD MATRIX PROBLEMS

Norieva Aziza Jasur qizi

Jizzakh branch of National University of Uzbekistan

named after Mirzo Ulugbek, assistant.

noriyevaaziza@gmail.com

ABSTRACT

In this article, one of the main sections of the science of algebra and number theory, non-standard problems related to matrices were seen. From the article, students can study higher mathematics, algebra and number theory independently or under the guidance of a professor. It can be used by students, young people and those interested in mathematics.

Keywords: *matrix, non-standard problem, rank, degree, elementary divisor.*

INTRODUCTION

Matrices are one of the main branches of algebra and number theory, and the dictionary meaning of the word matrix is a table made up of rectangular numbers. When solving systems of equations and any related problems, we encounter matrices. It is known that the numbers that make up the matrix are called its elements. [1]

METHODS

The following operations are appropriate on matrices: addition, subtraction, multiplication by a number. There is no concept of dividing a matrix by a matrix. Instead, the first matrix is multiplied by the second matrix. Such matrices can be added and subtracted only if the orders of the matrices are the same, that is, if the number of columns and rows of the matrices are equal, respectively. Only the inverse of a square matrix exists. [1]

RESULT

Matter. $A = \begin{pmatrix} \lambda^2-\lambda+4 & \lambda^2+3 \\ \lambda^2-2\lambda+3 & \lambda^2-\lambda+2 \end{pmatrix}$ matrix color is equal to 2 at what value of λ.

Solving.

$$A = \begin{pmatrix} \lambda^2-\lambda+4 & \lambda^2+3 \\ \lambda^2-2\lambda+3 & \lambda^2-\lambda+2 \end{pmatrix} \sim \begin{pmatrix} \lambda+1 & \lambda+1 \\ \lambda^2-2\lambda+3 & \lambda^2-\lambda+2 \end{pmatrix} \sim$$

$$\sim \begin{pmatrix} \lambda+1 & 0 \\ \lambda^2-2\lambda+3 & \lambda+1 \end{pmatrix} \sim \begin{pmatrix} \lambda+1 & 0 \\ \lambda^2-2\lambda+3 & \lambda+1 \end{pmatrix} \sim \begin{pmatrix} \lambda+1 & 0 \\ 6 & \lambda+1 \end{pmatrix}$$

So, $\lambda+1 \neq 0,\ \lambda \neq -1$.

Matter. Find the elementary divisors of the following matrix:

$$\begin{pmatrix} \lambda^3+2 & \lambda^3+1 \\ 2\lambda^3-\lambda^2-\lambda+3 & 2\lambda^3-\lambda^2-\lambda+2 \end{pmatrix}$$

Solving.

$$\begin{pmatrix} \lambda^3+2 & \lambda^3+1 \\ 2\lambda^3-\lambda^2-\lambda+3 & 2\lambda^3-\lambda^2-\lambda+2 \end{pmatrix} \sim \begin{pmatrix} 1 & \lambda^3+1 \\ 1 & 2\lambda^3-\lambda^2-\lambda+2 \end{pmatrix}$$

From this, we get $2\lambda^3-\lambda^2-\lambda+2 \neq \lambda^3+1$.

Simplifying the inequality, we find elementary divisors:

$$2\lambda^3-\lambda^2-\lambda+2 \neq \lambda^3+1$$

$$\lambda^3-\lambda^2-\lambda+1 \neq 0$$

$$(\lambda^3+1)-\lambda(\lambda+1) \neq 0$$

$$(\lambda+1)(\lambda-1)^2 \neq 0$$

Elementary divisors of the given matrix

$$(\lambda+1)(\lambda-1)^2.$$

Masala. $A = \begin{pmatrix} 1 & 1 \\ -1 & 3 \end{pmatrix}$ matritsaning A^{50} darajasini toping.

Matter. Find the degree A^{50} of the matrix $A = \begin{pmatrix} 1 & 1 \\ -1 & 3 \end{pmatrix}$

Solving. $A^2 = \begin{pmatrix} 1 & 1 \\ -1 & 3 \end{pmatrix} \cdot \begin{pmatrix} 1 & 1 \\ -1 & 3 \end{pmatrix} = \begin{pmatrix} 0 & 4 \\ -4 & 8 \end{pmatrix} = 2^2 \cdot \begin{pmatrix} 0 & 1 \\ -1 & 2 \end{pmatrix}$

$$A^3 = 2^2 \cdot \begin{pmatrix} 0 & 1 \\ -1 & 2 \end{pmatrix} \cdot \begin{pmatrix} 1 & 1 \\ -1 & 3 \end{pmatrix} = 2^2 \cdot \begin{pmatrix} -1 & 3 \\ -3 & 5 \end{pmatrix}$$

$$A^4 = 2^2 \begin{pmatrix} -1 & 3 \\ -3 & 5 \end{pmatrix} \cdot \begin{pmatrix} 1 & 1 \\ -1 & 3 \end{pmatrix} = 2^2 \cdot 2^2 \cdot \begin{pmatrix} -1 & 2 \\ -2 & 3 \end{pmatrix} = 2^4 \cdot \begin{pmatrix} -1 & 2 \\ -2 & 3 \end{pmatrix}$$

From these relations, we define the following recurrence relation:

$$A^{50} = 2^{50} \cdot \begin{pmatrix} -24 & 25 \\ -25 & 26 \end{pmatrix}.$$

CONCLUSION

In addition to mathematics, the department of matrices is taught to students of economics, biotechnology, psychology, chemistry, physics, and applied mathematics in higher educational institutions. During the study of matrices, students gain not only their professional knowledge, but also their thinking and worldview. increases. In the process of solving non-standard problems, the skill of using existing knowledge in unfamiliar situations is formed and developed.

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