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USING THE MAPLE SOFTWARE TOOL IN SOLVING A SYSTEM OF LINEAR EQUATIONS

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Annotation
This article presents an effective way to use information technology in math classes, showing a way to solve linear equations in the MAPLE program. The commands of the actions performed on matrices are given in the MAPLE program, and the method of solving a system of Linear Equations by shifting them to Matrix equations is illuminated by examples.

Keywords: MAPLE program, system of linear equations, matrix, matrix multiplication, inverse Matrix.

Introduction

ETA statya predostavlyaet effektivniy sposob ispolzovaniya informasionnix technologiy V uroke mathematicians, kotoriy pokazivaet reshenie lineynix uravneniy v MAPLE. Instruktsii dlya Matrix privedeni V programme MAPLE, a takje pokazan method lineynix uravneniy I IX reshenie dlya matrichnix uravneniy.
Klyuchevie slova: MAPLE, Sistema lineynix uravneny, Matrix, umnogenie Matrix, obratnaya Matrix.
This article provides an effective way to use information technology in math lesson, which shows the solution of linear equations in MAPLE. Here are some examples of how the matrices are executed in the MAPLE program and the method of solving the linear equations system on matrix equations.
Key words: MAPLE, linear equations system, matrix, multiplication of matrices, inverse matrix.
In the following years, a lot of scientific and methodological work is being done to solve the problems of applying modern computing and Information Technology in the educational system. International conferences at various levels are held on these global problems of the educational system, and materials on various topics are published in them. In some works, various standards and methods of teaching mathematics were considered, the main focus was on the creation of multimedia electronic teaching aids for Mathematical Sciences on the basis of computer and Web technologies. Another series of works covered the issues of the introduction of the MathCad system to the teaching of mathematics.
In addition, at conferences dedicated to modern information and pedagogical technologies, work began to appear on the application of the MAPLE mathematical system to the process of teaching mathematics.
One can say that the MAPLE mathematical system, which arose at the stage of introducing modern information and pedagogical technologies into the teaching of basic objects, is one of the modern technologies that can be used in the teaching of Mathematical Sciences. In order to substantiate our opinion, let's dwell on the possibilities of this system.
MAPLE is a computerized mathematical system that can be widely used to solve mathematical

problems. The system was created by Waterloo Maple Ins Corporation of Canada on June 21, 2001, which until recently was called the computerized system of algebra. Early versions were created earlier.With the help of the system, symbolic, numerical calculations can be performed quickly and efficiently, in addition, it has a high graphic capacity and is convenient to prepare electronic documents.

The MAPLE mathematical system can be used to solve scientific and technical issues in general secondary education as well as in higher education mathematics, from solving educational issues to modeling complex practical issues. Therefore, this system is effectively used in teaching mathematics and solving scientific issues in more than 300 prestigious universities around the world(including MDU, UZMU).

MAPLE is a system that embodies the achievements of modern information technology until the last years, and can be used as a programming language, for preparing and editing documents. It contains thousands of examples of help system, numerical and symbolic processor, Diagnostic System, Library of standard and auxiliary functions, rules and algorithms aimed at expressing and modifying mathematical expressions in different ways are summarized. It is designed to work in a user interaction system.

A number of higher mathematics issues can be solved using the MAPLE program. One such issue is the question of solving a system of linear equations in a matrix way.

To enter a matrix in a MAPLE program, it is necessary to recall the library of linear algebra before. This is done by entering the command with(Student[LinearAlgebra]):. After the library is called the matrix matrix (n, m, [[A11, A12,..., A1M], [A21, A22,..., A2M],..., [an1, an2,..., ANM]); the command is used. Where n is the number of rows in the Matrix, m is the number of columns in the Matrix. As an example, let's enter the following command:**> with(Student[LinearAlgebra]):**

> A:=matrix(3,3,[[2,7,13],[3,14,12],[2,25,16]]);

then the following matrix is generated in the MAPLE program working window. $A := \begin{bmatrix} 2 & 7 & 13 \\ 3 & 14 & 12 \\ 2 & 25 & 16 \end{bmatrix}$

Using the above command,matrices can be entered through their lines if a:=< A11, A21,..., aN1 > | < A12, A22,..., an2 > | < A1N, a2n,..., amn>; the command can be used to enter matrices through its column. For example:**> A := <<2,3,5>|<7,14,25>|<13,12,16>>;**

$$A := \begin{bmatrix} 2 & 7 & 13 \\ 3 & 14 & 12 \\ 2 & 25 & 16 \end{bmatrix}$$

To find the inverse matrix to a given matrix, the command A^(-1); is used. Let the inverse Matrix dressing to the matrix above:

> A^(-1);

$$\begin{bmatrix} \frac{76}{3} & -71 & \frac{98}{3} \\ -4 & 11 & -5 \\ \frac{-5}{3} & 5 & \frac{-7}{3} \end{bmatrix}$$

And for multiplying a given two matrices,the command multiply(A, B); is used.

Example:

```
> A:= matrix([[1,-1,1],[1,2,0],[2,1,2]]);
```

$$A := \begin{bmatrix} 1 & -1 & 1 \\ 1 & 2 & 0 \\ 2 & 1 & 2 \end{bmatrix}$$

```
> B:= matrix([[1,1,2],[3,-2,0],[-2,3,3]]);
```

$$B := \begin{bmatrix} 1 & 1 & 2 \\ 3 & -2 & 0 \\ -2 & 3 & 3 \end{bmatrix}$$

```
> multiply(A,B);
```

$$\begin{bmatrix} -4 & 6 & 5 \\ 7 & -3 & 2 \\ 1 & 6 & 10 \end{bmatrix}$$

If the matrices are introduced by columns A to multiply them.The B command is used.

Misol:

```
> A:=<<1,1,2>|<2,3,-1>|<4,0,3>>;
```

$$A := \begin{bmatrix} 1 & 2 & 4 \\ 1 & 3 & 0 \\ 2 & -1 & 3 \end{bmatrix}$$

```
> B:=<<-1,2,1>|<2,1,3>>;
```

$$B := \begin{bmatrix} -1 & 2 \\ 2 & 1 \\ 1 & 3 \end{bmatrix}$$

```
> A.B;
```

$$\begin{bmatrix} 7 & 16 \\ 5 & 5 \\ -1 & 12 \end{bmatrix}$$

Where the system of linear equations is given by

$$\begin{cases} a_{11}x_1 + a_{12}x_2 + \ldots + a_{1n}x_n = b_1 \\ a_{21}x_1 + a_{22}x_2 + \ldots + a_{2n}x_n = b_2 \\ \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \\ a_{m1}x_1 + a_{m2}x_2 + \ldots + a_{2mn}x_n = b_m \end{cases}$$

writing a system of given linear equations in terms of a matrix equation becomes:
$A \times X = B$.

where A is a matrix constructed from the coefficients of the system of equations before the unknowns. B is a matrix constructed from the free terms of a system of equations. X is a nameless matrix composed of unknowns, i.e.:

$$A=\begin{pmatrix}\alpha_{11} & \alpha_{12} & \dots & \alpha_{1n}\\ \alpha_{21} & \alpha_{22} & \dots & \alpha_{2n}\\ \text{----------} & & & \\ \alpha_{n1} & \alpha_{n2} & \dots & \alpha_{nn}\end{pmatrix},\quad X=\begin{pmatrix}x_1\\ x_2\\ \vdots\\ x_n\end{pmatrix},\quad B=\begin{pmatrix}\beta_1\\ \beta_2\\ \vdots\\ \beta_n\end{pmatrix}$$

$A\times X=B$ to find the Matrix X from the equation, we multiply the Matrix B by The Matrix A, which is inverse to The Matrix A.

$X \; A \; B$

These steps can be done freely in the MAPLE program.

Example: $\begin{cases}x_1-x_2+x_3=6\\ 2x_1+x_2+.x_3=3\\ x_1+x_2+2x_3=5\end{cases}$ solve the system of equations in the MAPLE program.

Solution:**> with(linalg):**

> A:=<<1,2,1>|<-1,1,1>|<1,1,2>>;

$$A:=\begin{bmatrix}1 & -1 & 1\\ 2 & 1 & 1\\ 1 & 1 & 2\end{bmatrix}$$

> B:=<<6,3,5>>;

$$B:=\begin{bmatrix}6\\ 3\\ 5\end{bmatrix}$$

> C:=A^(-1);

$$C:=\begin{bmatrix}\frac{1}{5} & \frac{3}{5} & \frac{-2}{5}\\ \frac{-3}{5} & \frac{1}{5} & \frac{1}{5}\\ \frac{1}{5} & \frac{-2}{5} & \frac{3}{5}\end{bmatrix}$$

> X:=multiply(A^(-1),B);

$$X:=\begin{bmatrix}1\\ -2\\ 3\end{bmatrix}$$

Hence,since the solution of the system of equations is (1, -2,3).

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