

Laboratory 1.

Bonus task for the fearless: Build (draw) a recognizable picture (fractals, a cat, a flower, a sketch, whatever you like) using non-zero elements of the matrix.

Working in a text editor

(use debugger to interactively run code)

Team 1

- 1) Find the results of three expressions and determine the type: $2/\sin(0)$; $2 \sin(\pi)/\arctg(0)$; $[1 \ 2; \pi \ \text{sqrt}(-1)]$. . See type control commands: `>>help is*`
- 2) Find the determinant of the system
$$\begin{cases} 2x + y - z = 1 \\ -x + y + 2z = 7 \\ 0.5x - y - 0.5z = -3 \end{cases}$$

Solve the system using the Gauss method. Check the accuracy of this solution using the Euclidean norm.
- 3) Build a block-diagonal matrix R, which consists of a scalar, a random integer matrix of the third order – B, a diagonal matrix whose main diagonal is the secondary diagonal B. Determine the number of nonzero elements. Visualize the resulting matrix graphically, designate its elements with green circles of the agreed size. Determine the product of the positive elements of the constructed matrix, write this value in the window title for spy.
- 4) Edit the matrix R (see p.3) so that you get a matrix A (m,n), consisting of all (k) non-zero elements of the matrix R, choose the form of A, i.e. (m,n), so that $k=m*n$, if necessary, supplement the missing elements with ones (or remove the extra ones). Show the structure of A using spy.

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Team 2

- 1) Find the results of three expressions and determine the type: $\cos(\pi)/\text{tg}(0)$; $2 \sin(2\pi)/\sin(0)$; $[1 \ 0; \pi \ \text{sqrt}(-1)]$. See type control commands: `>>help is*`
- 2) Find the determinant of the system
$$\begin{cases} 7x - z = -1.6 \\ x - y + 12z = 26.5 \\ 1.5x - y - 1.5z = -4.5 \end{cases}$$

Solve the system using the Gauss method. Check the accuracy of this solution using the Euclidean norm.
- 3) Build a block-diagonal matrix R, which consists of a matrix of the 3rd order, all elements of which are equal to three, a random matrix A of the third order with elements from the interval (2,7), an upper triangular matrix built on the basis of the matrix A and a magic square of the 4th order. Determine the number of non-zero elements. Visualize the resulting matrix graphically; designate its non-zero elements with blue asterisks of the agreed size. Determine the sum of the elements of the constructed matrix, write it in the window title for spy.
- 4) Edit the matrix R (see p.3) so that you get a matrix A (m,n) consisting of all (k) non-zero elements of the matrix R, choose the form of A, i.e. (m,n), so that $k=m*n$, if necessary, supplement the missing elements with ones. Edit the elements in a checkerboard pattern with zeros. Show the structure of A using spy

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Team 3

- 1) Find the results of three expressions and determine the type: $\cos(\pi)/\text{tg}(0)$; $2 \sin(2\pi)/\sin(0)$; $[1 \ 3i; 0 \ \pi]$. See type control commands: `>>help is*`
- 2) Find the determinant of the system
$$\begin{cases} y - z = -1 \\ -x + 2z = 1 \\ 0.5x - y + 2z = 2.5 \end{cases}$$

Solve the system using the Gauss method. Check the accuracy of this solution using the Euclidean norm.
- 3) Construct a block-diagonal matrix R, which consists of a magic square of the 4th order, a random integer matrix A of the third order with elements greater than two, and a matrix of the second order B, whose elements are sines of the elements of the same size matrix C, C is obtained randomly, its elements are uniformly distributed on the segment $[0,1]$. Determine the number of non-zero elements of R. Visualize the resulting matrix graphically, designate the non-zero elements of which with red triangles of the agreed size. Determine the number of elements less than 0.5 of the resulting matrix, write this value in the window title for spy.
- 4) Edit the matrix R (see p.3) so that you get a matrix A (m,n) such that m is equal to the number of rows of the maximum block R, and n is unchanged. Place all blocks starting from the first row of the resulting matrix A, and leave the columns unchanged. Show the structure of A using spy.

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Team 4

- 1) Find the results of three expressions and determine the type: $\cos(2\pi)/\arctg(0)$; $2 \sin(2\pi)/\sin(0)$; $[1 \ 3i; 0 \ \pi]$. See type checking commands: `>>help is*`
- 2) Find the determinant of the system
$$\begin{cases} 3y - z = 3 \\ x - y + 2z = 1 \\ 2.5x - y - z = 4 \end{cases}$$

Solve the system using the Gauss method. Check the accuracy of this solution using the Euclidean norm.
- 3) Construct a block-diagonal matrix R consisting of a random integer matrix A of order four with elements less than six, a matrix of order three B whose elements are the square root of the elements of a random matrix uniformly distributed on the interval $[1,3]$, and a random matrix C of order three with uniformly distributed elements on the interval $[0,1]$. Determine the number of nonzero elements. Visualize the resulting matrix graphically, designating the nonzero elements with a turquoise hexagonal star of the agreed size. Determine the number of nonzero elements and the maximum element of the resulting matrix, write them in the window title for spy.
- 4) Edit the matrix R (see p.3) so that you get a matrix A (m,n) such that n is equal to the number of columns of the maximum block of the matrix R, and the number of rows is m. Place all blocks starting from the first column of the resulting matrix A, and leave the rows of the blocks unchanged. Show the structure of A using spy. Replace zero elements with ones and make sure (spy) that the editing is done correctly.

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Team 5

- 1) Find the results of three expressions and determine the type: $2/\sin(0)$; $0*\text{eps}/\arctg(0)$;

[1 2; π sqrt(-1)]. See type control commands: >>help is*

2) Find the determinant of the system
$$\begin{cases} 6x + y - z = 3.2 \\ -x + y + 2z = 5.2 \\ 0.5x - y - 3z = 9.3 \end{cases}$$

Solve the system using the Gauss method. Check the accuracy of this solution using the Euclidean norm.

- 3) Build a block-diagonal matrix R, which consists of a scalar, a random integer matrix of the third order – B with elements less than 15 and an upper triangular matrix obtained from B. Determine the number of non-zero elements in R. Visualize the resulting matrix graphically, designate its non-zero elements with green circles of the agreed size. Determine the product of the elements of the constructed matrix, write this value in the window title for spy.
- 4) Edit the matrix R so that it has zero even rows. Find the sum-S of all elements of the resulting matrix. Show the structure of the edited matrix using spy and in the same graphic window, place the result S in any place.