Variant 1

1. Find the best approximation matrix A_1 of rank 2 of the matrix A in the norm $||\cdot||_2$ and find $||A - A_1||_2$, where

$$A = \begin{bmatrix} 11 & -28 & 2 & -12 \\ -26 & 16 & -2 & 6 \\ 16 & -2 & -8 & -9 \end{bmatrix}$$

2. Estimate the relative error of the approximate solution $(1, 1)$ of the system $AX = b$ in the norms $|\cdot|_1$ and $|\cdot|_2$ using the condition number of the matrix A, where

$$A = \begin{pmatrix} 5.06 & -0.18 \\ 8.1 & -5.85 \end{pmatrix}, b = \begin{pmatrix} 4.84 \\ 2.08 \end{pmatrix}$$

3. Solve the system approximately and estimate the error of the solution in the norms $|\cdot|_1, |\cdot|_2, |\cdot|_\infty$:

$$\begin{cases} -2(8 + \varepsilon_1)x + 4(-2 + \varepsilon_2)y = -1 + \varepsilon_3 \\ 1x + (4 + \varepsilon_1)y = 1 + \varepsilon_4, \end{cases}$$

   where the unknown numbers ε_j satisfy the conditions $|\varepsilon_j| < 0.05$ for all $j = 1, \ldots, 4$.

4. Find the approximate inverse matrix to the matrix A and evaluate the approximation error with respect to the uniform norm $\|\cdot\|_1$ if the elements of the matrix A are known with an absolute error of 0.01:

$$A \approx \begin{pmatrix} -2 & -8 \\ 5 & -1 \end{pmatrix}$$

5. Use simple iteration method for finding the solution of the given linear system

$$\begin{cases} 22x + 3y + 3z = 2, \\ 2x + 20y + 3z = 8, \\ 6x + 7y + 25z = 6. \end{cases}$$

   Determine the iteration number after which the approximation error for each coordinate does not exceed 0.01 and find the corresponding approximate solution. Start with $x_0 = [0, 0, 0]^T$.

6. Find the most influential vertex in the graph using the PageRank algorithm with $\beta = 0.15$, where the graph adjacency matrix is defined as follows

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

7. Find the value $f(A)$ of the function $f(l) = e^{l+2}$, where

$$A = \begin{pmatrix} 1 & -6 & -7 \\ -1 & -2 & -5 \\ 1 & 6 & 9 \end{pmatrix}$$

Variant 2

1. Find the best approximation matrix A_1 of rank 2 of the matrix A in the norm $||\cdot||_2$ and find $||A - A_1||_2$, where

$$A = \begin{bmatrix} 54 & 0 & 32 & -34 \\ -45 & -54 & 70 & -20 \\ -18 & 0 & -76 & 44 \end{bmatrix}$$

2. Estimate the relative error of the approximate solution $(1, 1)$ of the system $AX = b$ in the norms $|\cdot|_1$ and $|\cdot|_2$ using the condition number of the matrix A, where

$$A = \begin{pmatrix} 3.0 & -0.03 \\ -4.11 & -1.15 \end{pmatrix}, b = \begin{pmatrix} 2.99 \\ -4.97 \end{pmatrix}$$

3. Solve the system approximately and estimate the error of the solution in the norms $|\cdot|_1, |\cdot|_2, |\cdot|_\infty$:

$$\begin{cases} 3(-8 + \varepsilon_1)x + 4(4 + \varepsilon_2)y = -5 + \varepsilon_3 \\ 4x + (-1 + \varepsilon_1)y = 1 + \varepsilon_4, \end{cases}$$

   where the unknown numbers ε_j satisfy the conditions $|\varepsilon_j| < 0.05$ for all $j = 1, \ldots, 4$.

4. Find the approximate inverse matrix to the matrix A and evaluate the approximation error with respect to the uniform norm $\|\cdot\|_1$ if the elements of the matrix A are known with an absolute error of 0.01:

$$A \approx \begin{pmatrix} -4 & 7 \\ 3 & 9 \end{pmatrix}$$

5. Use simple iteration method for finding the solution of the given linear system

$$\begin{cases} 24x + 4y + 2z = 9, \\ 3x + 27y + 4z = 8, \\ 1x + 9y + 24z = 8. \end{cases}$$

   Determine the iteration number after which the approximation error for each coordinate does not exceed 0.01 and find the corresponding approximate solution. Start with $x_0 = [0, 0, 0]^T$.

6. Find the most influential vertex in the graph using the PageRank algorithm with $\beta = 0.15$, where the graph adjacency matrix is defined as follows

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

7. Find the value $f(A)$ of the function $f(l) = e^{l+2}$, where

$$A = \begin{pmatrix} 11 & 7 & -4 \\ 17 & 17 & -8 \\ 48 & 40 & -20 \end{pmatrix}$$

Variant 3

1. Find the best approximation matrix A_1 of rank 2 of the matrix A in the norm $||\cdot||_2$ and find $||A - A_1||_2$, where

$$A = \begin{bmatrix} -19 & -14 & 52 & -36 \\ 26 & 52 & -50 & 0 \\ -32 & -76 & -31 & 18 \end{bmatrix}$$

2. Estimate the relative error of the approximate solution $(1, 1)$ of the system $AX = b$ in the norms $|\cdot|_1$ and $|\cdot|_2$ using the condition number of the matrix A, where

$$A = \begin{pmatrix} 1.0 & -0.06 \\ -4.91 & -7.02 \end{pmatrix}, b = \begin{pmatrix} 0.98 \\ -12.09 \end{pmatrix}$$

3. Solve the system approximately and estimate the error of the solution in the norms $|\cdot|_1, |\cdot|_2, |\cdot|_\infty$:

$$\begin{cases} (-10 + \varepsilon_1)x + 2(-3 + \varepsilon_2)y = -3 + \varepsilon_3 \\ -3x + (-4 + \varepsilon_1)y = -4 + \varepsilon_4, \end{cases}$$

   where the unknown numbers ε_j satisfy the conditions $|\varepsilon_j| < 0.05$ for all $j = 1, \ldots, 4$.

4. Find the approximate inverse matrix to the matrix A and evaluate the approximation error with respect to the uniform norm $\|\cdot\|_1$ if the elements of the matrix A are known with an absolute error of 0.01:

$$A \approx \begin{pmatrix} -7 & 2 \\ -4 & 6 \end{pmatrix}$$

5. Use simple iteration method for finding the solution of the given linear system

$$\begin{cases} 20x + 4y + 6z = 4, \\ 3x + 21y + 7z = 2, \\ 2x + 9y + 27z = 5. \end{cases}$$

   Determine the iteration number after which the approximation error for each coordinate does not exceed 0.01 and find the corresponding approximate solution. Start with $x_0 = [0, 0, 0]^T$.

6. Find the most influential vertex in the graph using the PageRank algorithm with $\beta = 0.15$, where the graph adjacency matrix is defined as follows

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

7. Find the value $f(A)$ of the function $f(l) = ln(l + 4)$, where

$$A = \begin{pmatrix} 9 & -5 & -6 \\ -21 & 16 & 17 \\ 24 & -15 & -17 \end{pmatrix}$$

Variant 4

1. Find the best approximation matrix A_1 of rank 2 of the matrix A in the norm $||\cdot||_2$ and find $||A - A_1||_2$, where

$$A = \begin{bmatrix} -9 & 78 & 28 & -82 \\ 54 & -66 & -8 & 23 \\ -36 & -24 & -103 & 64 \end{bmatrix}$$

2. Estimate the relative error of the approximate solution $(1, 1)$ of the system $AX = b$ in the norms $|\cdot|_1$ and $|\cdot|_2$ using the condition number of the matrix A, where

$$A = \begin{pmatrix} -3.02 & 0.19 \\ 6.05 & -3.92 \end{pmatrix}, b = \begin{pmatrix} -3.0 \\ 1.94 \end{pmatrix}$$

3. Solve the system approximately and estimate the error of the solution in the norms $|\cdot|_1, |\cdot|_2, |\cdot|_\infty$:

$$\begin{cases} -3(2 + \varepsilon_1)x + 4(-1 + \varepsilon_2)y = 1 + \varepsilon_3 \\ -4x + (-3 + \varepsilon_1)y = 1 + \varepsilon_4, \end{cases}$$

   where the unknown numbers ε_j satisfy the conditions $|\varepsilon_j| < 0.05$ for all $j = 1, \ldots, 4$.

4. Find the approximate inverse matrix to the matrix A and evaluate the approximation error with respect to the uniform norm $\|\cdot\|_1$ if the elements of the matrix A are known with an absolute error of 0.01:

$$A \approx \begin{pmatrix} -6 & -6 \\ -1 & -5 \end{pmatrix}$$

5. Use simple iteration method for finding the solution of the given linear system

$$\begin{cases} 26x + 6y + 4z = 7, \\ 3x + 24y + 4z = 1, \\ 8x + 6y + 26z = 1. \end{cases}$$

   Determine the iteration number after which the approximation error for each coordinate does not exceed 0.01 and find the corresponding approximate solution. Start with $x_0 = [0, 0, 0]^T$.

6. Find the most influential vertex in the graph using the PageRank algorithm with $\beta = 0.15$, where the graph adjacency matrix is defined as follows

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

7. Find the value $f(A)$ of the function $f(l) = ln(l + 2)$, where

$$A = \begin{pmatrix} 4 & -1 & 1 \\ -18 & -19 & 9 \\ -38 & -51 & 25 \end{pmatrix}$$

Variant 5

1. Find the best approximation matrix A_1 of rank 2 of the matrix A in the norm $||\cdot||_2$ and find $||A - A_1||_2$, where

$$A = \begin{bmatrix} -12 & 26 & -66 & -40 \\ 42 & -52 & 15 & 68 \\ -60 & -29 & 48 & -74 \end{bmatrix}$$

2. Estimate the relative error of the approximate solution $(1, 1)$ of the system $AX = b$ in the norms $|\cdot|_1$ and $|\cdot|_2$ using the condition number of the matrix A, where

$$A = \begin{pmatrix} -2.0 & 0.16 \\ -1.99 & -5.85 \end{pmatrix}, b = \begin{pmatrix} -1.97 \\ -7.9 \end{pmatrix}$$

3. Solve the system approximately and estimate the error of the solution in the norms $|\cdot|_1, |\cdot|_2, |\cdot|_\infty$:

$$\begin{cases} -2(-4 + \varepsilon_1)x + 3(3 + \varepsilon_2)y = -2 + \varepsilon_3 \\ 4x + (-1 + \varepsilon_1)y = -4 + \varepsilon_4, \end{cases}$$

   where the unknown numbers ε_j satisfy the conditions $|\varepsilon_j| < 0.05$ for all $j = 1, \ldots, 4$.

4. Find the approximate inverse matrix to the matrix A and evaluate the approximation error with respect to the uniform norm $\|\cdot\|_1$ if the elements of the matrix A are known with an absolute error of 0.01:

$$A \approx \begin{pmatrix} 8 & -6 \\ 0 & 9 \end{pmatrix}$$

5. Use simple iteration method for finding the solution of the given linear system

$$\begin{cases} 25x + 9y + 3z = 8, \\ 8x + 25y + 4z = 1, \\ 3x + 8y + 25z = 2. \end{cases}$$

   Determine the iteration number after which the approximation error for each coordinate does not exceed 0.01 and find the corresponding approximate solution. Start with $x_0 = [0, 0, 0]^T$.

6. Find the most influential vertex in the graph using the PageRank algorithm with $\beta = 0.15$, where the graph adjacency matrix is defined as follows

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

7. Find the value $f(A)$ of the function $f(l) = ln(l + 4)$, where

$$A = \begin{pmatrix} 2 & -3 & 4 \\ -1 & 7 & -7 \\ -1 & 3 & -3 \end{pmatrix}$$

Variant 6

1. Find the best approximation matrix A_1 of rank 2 of the matrix A in the norm $||\cdot||_2$ and find $||A - A_1||_2$, where

$$A = \begin{bmatrix} 51 & -56 & -18 & 8 \\ -12 & 43 & -36 & -22 \\ -78 & -10 & 0 & -26 \end{bmatrix}$$

2. Estimate the relative error of the approximate solution $(1, 1)$ of the system $AX = b$ in the norms $|\cdot|_1$ and $|\cdot|_2$ using the condition number of the matrix A, where

$$A = \begin{pmatrix} -4.03 & -0.11 \\ -2.2 & -6.83 \end{pmatrix}, b = \begin{pmatrix} -4.07 \\ -9.1 \end{pmatrix}$$

3. Solve the system approximately and estimate the error of the solution in the norms $|\cdot|_1, |\cdot|_2, |\cdot|_\infty$:

$$\begin{cases} -4(-4 + \varepsilon_1)x + 4(-3 + \varepsilon_2)y = 1 + \varepsilon_3 \\ -5x + (-2 + \varepsilon_1)y = -1 + \varepsilon_4, \end{cases}$$

   where the unknown numbers ε_j satisfy the conditions $|\varepsilon_j| < 0.05$ for all $j = 1, \ldots, 4$.

4. Find the approximate inverse matrix to the matrix A and evaluate the approximation error with respect to the uniform norm $\|\cdot\|_1$ if the elements of the matrix A are known with an absolute error of 0.01:

$$A \approx \begin{pmatrix} 9 & -2 \\ -2 & 5 \end{pmatrix}$$

5. Use simple iteration method for finding the solution of the given linear system

$$\begin{cases} 21x + 3y + 2z = 6, \\ 2x + 20y + 1z = 4, \\ 9x + 8y + 22z = 5. \end{cases}$$

   Determine the iteration number after which the approximation error for each coordinate does not exceed 0.01 and find the corresponding approximate solution. Start with $x_0 = [0, 0, 0]^T$.

6. Find the most influential vertex in the graph using the PageRank algorithm with $\beta = 0.15$, where the graph adjacency matrix is defined as follows

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

7. Find the value $f(A)$ of the function $f(l) = e^{l+3}$, where

$$A = \begin{pmatrix} 11 & -2 & -3 \\ 36 & -7 & -10 \\ -12 & 4 & 3 \end{pmatrix}$$

Variant 7

1. Find the best approximation matrix A_1 of rank 2 of the matrix A in the norm $||\cdot||_2$ and find $||A - A_1||_2$, where

$$A = \begin{bmatrix} -56 & -67 & -42 & -68 \\ -4 & -38 & -6 & 104 \\ -76 & 58 & 27 & -16 \end{bmatrix}$$

2. Estimate the relative error of the approximate solution $(1, 1)$ of the system $AX = b$ in the norms $|\cdot|_1$ and $|\cdot|_2$ using the condition number of the matrix A, where

$$A = \begin{pmatrix} -2.93 & 0.12 \\ 2.04 & -1.85 \end{pmatrix}, b = \begin{pmatrix} -2.9 \\ 0.06 \end{pmatrix}$$

3. Solve the system approximately and estimate the error of the solution in the norms $|\cdot|_1, |\cdot|_2, |\cdot|_\infty$:

$$\begin{cases} -3(6 + \varepsilon_1)x + 3(3 + \varepsilon_2)y = -3 + \varepsilon_3 \\ 3x + (4 + \varepsilon_1)y = -3 + \varepsilon_4, \end{cases}$$

   where the unknown numbers ε_j satisfy the conditions $|\varepsilon_j| < 0.05$ for all $j = 1, \ldots, 4$.

4. Find the approximate inverse matrix to the matrix A and evaluate the approximation error with respect to the uniform norm $\|\cdot\|_1$ if the elements of the matrix A are known with an absolute error of 0.01:

$$A \approx \begin{pmatrix} 0 & 8 \\ -6 & -9 \end{pmatrix}$$

5. Use simple iteration method for finding the solution of the given linear system

$$\begin{cases} 25x + 1y + 7z = 4, \\ 7x + 26y + 4z = 7, \\ 8x + 6y + 27z = 1. \end{cases}$$

   Determine the iteration number after which the approximation error for each coordinate does not exceed 0.01 and find the corresponding approximate solution. Start with $x_0 = [0, 0, 0]^T$.

6. Find the most influential vertex in the graph using the PageRank algorithm with $\beta = 0.15$, where the graph adjacency matrix is defined as follows

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

7. Find the value $f(A)$ of the function $f(l) = e^{l+1}$, where

$$A = \begin{pmatrix} 16 & 8 & 7 \\ -21 & -10 & -10 \\ -3 & -2 & 0 \end{pmatrix}$$

Variant 8

1. Find the best approximation matrix A_1 of rank 2 of the matrix A in the norm $||\cdot||_2$ and find $||A - A_1||_2$, where

$$A = \begin{bmatrix} 42 & -86 & -46 & 8 \\ -39 & 68 & -110 & 40 \\ -18 & 52 & 83 & -64 \end{bmatrix}$$

2. Estimate the relative error of the approximate solution $(1, 1)$ of the system $AX = b$ in the norms $|\cdot|_1$ and $|\cdot|_2$ using the condition number of the matrix A, where

$$A = \begin{pmatrix} 4.0 & 0.18 \\ 3.94 & -7.92 \end{pmatrix}, b = \begin{pmatrix} 4.17 \\ -4.09 \end{pmatrix}$$

3. Solve the system approximately and estimate the error of the solution in the norms $|\cdot|_1, |\cdot|_2, |\cdot|_\infty$:

$$\begin{cases} 4(-8 + \varepsilon_1)x + 2(-5 + \varepsilon_2)y = 4 + \varepsilon_3 \\ 4x + (3 + \varepsilon_1)y = -1 + \varepsilon_4, \end{cases}$$

   where the unknown numbers ε_j satisfy the conditions $|\varepsilon_j| < 0.05$ for all $j = 1, \ldots, 4$.

4. Find the approximate inverse matrix to the matrix A and evaluate the approximation error with respect to the uniform norm $\|\cdot\|_1$ if the elements of the matrix A are known with an absolute error of 0.01:

$$A \approx \begin{pmatrix} 6 & -1 \\ -4 & 9 \end{pmatrix}$$

5. Use simple iteration method for finding the solution of the given linear system

$$\begin{cases} 26x + 4y + 5z = 5, \\ 7x + 24y + 6z = 6, \\ 5x + 3y + 27z = 2. \end{cases}$$

   Determine the iteration number after which the approximation error for each coordinate does not exceed 0.01 and find the corresponding approximate solution. Start with $x_0 = [0, 0, 0]^T$.

6. Find the most influential vertex in the graph using the PageRank algorithm with $\beta = 0.15$, where the graph adjacency matrix is defined as follows

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

7. Find the value $f(A)$ of the function $f(l) = e^{l+1}$, where

$$A = \begin{pmatrix} 0 & 0 & -1 \\ -14 & -10 & -13 \\ 20 & 16 & 20 \end{pmatrix}$$

Variant 9

1. Find the best approximation matrix A_1 of rank 2 of the matrix A in the norm $||\cdot||_2$ and find $||A - A_1||_2$, where

$$A = \begin{bmatrix} 0 & -23 & -58 & -20 \\ 30 & -22 & 34 & 32 \\ -48 & 2 & -5 & -4 \end{bmatrix}$$

2. Estimate the relative error of the approximate solution $(1, 1)$ of the system $AX = b$ in the norms $|\cdot|_1$ and $|\cdot|_2$ using the condition number of the matrix A, where

$$A = \begin{pmatrix} 2.94 & -0.01 \\ 2.83 & -3.99 \end{pmatrix}, b = \begin{pmatrix} 3.17 \\ -0.92 \end{pmatrix}$$

3. Solve the system approximately and estimate the error of the solution in the norms $|\cdot|_1, |\cdot|_2, |\cdot|_\infty$:

$$\begin{cases} 3(8 + \varepsilon_1)x + 3(3 + \varepsilon_2)y = -4 + \varepsilon_3 \\ -3x + (2 + \varepsilon_1)y = 1 + \varepsilon_4, \end{cases}$$

   where the unknown numbers ε_j satisfy the conditions $|\varepsilon_j| < 0.05$ for all $j = 1, \ldots, 4$.

4. Find the approximate inverse matrix to the matrix A and evaluate the approximation error with respect to the uniform norm $\|\cdot\|_1$ if the elements of the matrix A are known with an absolute error of 0.01:

$$A \approx \begin{pmatrix} -5 & -1 \\ 1 & 9 \end{pmatrix}$$

5. Use simple iteration method for finding the solution of the given linear system

$$\begin{cases} 22x + 9y + 5z = 9, \\ 4x + 24y + 2z = 1, \\ 1x + 8y + 21z = 4. \end{cases}$$

   Determine the iteration number after which the approximation error for each coordinate does not exceed 0.01 and find the corresponding approximate solution. Start with $x_0 = [0, 0, 0]^T$.

6. Find the most influential vertex in the graph using the PageRank algorithm with $\beta = 0.15$, where the graph adjacency matrix is defined as follows

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

7. Find the value $f(A)$ of the function $f(l) = ln(l + 2)$, where

$$A = \begin{pmatrix} 21 & -13 & 7 \\ 26 & -16 & 9 \\ -2 & 1 & 0 \end{pmatrix}$$

Variant 10

1. Find the best approximation matrix A_1 of rank 2 of the matrix A in the norm $||\cdot||_2$ and find $||A - A_1||_2$, where

$$A = \begin{bmatrix} -70 & -56 & -42 & -1 \\ -32 & -16 & 24 & -50 \\ 76 & 44 & -30 & 10 \end{bmatrix}$$

2. Estimate the relative error of the approximate solution $(1, 1)$ of the system $AX = b$ in the norms $|\cdot|_1$ and $|\cdot|_2$ using the condition number of the matrix A, where

$$A = \begin{pmatrix} -0.97 & 0.14 \\ 2.9 & -7.17 \end{pmatrix}, b = \begin{pmatrix} -1.03 \\ -4.07 \end{pmatrix}$$

3. Solve the system approximately and estimate the error of the solution in the norms $|\cdot|_1, |\cdot|_2, |\cdot|_\infty$:

$$\begin{cases} -(8 + \varepsilon_1)x + 4(-3 + \varepsilon_2)y = 2 + \varepsilon_3 \\ 1x + (-2 + \varepsilon_1)y = -3 + \varepsilon_4, \end{cases}$$

   where the unknown numbers ε_j satisfy the conditions $|\varepsilon_j| < 0.05$ for all $j = 1, \ldots, 4$.

4. Find the approximate inverse matrix to the matrix A and evaluate the approximation error with respect to the uniform norm $\|\cdot\|_1$ if the elements of the matrix A are known with an absolute error of 0.01:

$$A \approx \begin{pmatrix} 2 & 5 \\ 4 & 4 \end{pmatrix}$$

5. Use simple iteration method for finding the solution of the given linear system

$$\begin{cases} 26x + 8y + 7z = 9, \\ 7x + 25y + 4z = 5, \\ 4x + 2y + 23z = 1. \end{cases}$$

   Determine the iteration number after which the approximation error for each coordinate does not exceed 0.01 and find the corresponding approximate solution. Start with $x_0 = [0, 0, 0]^T$.

6. Find the most influential vertex in the graph using the PageRank algorithm with $\beta = 0.15$, where the graph adjacency matrix is defined as follows

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

7. Find the value $f(A)$ of the function $f(l) = e^{l+1}$, where

$$A = \begin{pmatrix} -20 & -8 & 7 \\ 13 & 7 & -4 \\ -62 & -22 & 22 \end{pmatrix}$$

Variant 11

1. Find the best approximation matrix A_1 of rank 2 of the matrix A in the norm $||\cdot||_2$ and find $||A - A_1||_2$, where

$$A = \begin{bmatrix} 18 & 2 & -13 & -14 \\ -30 & 14 & 2 & -5 \\ 6 & -32 & -14 & 2 \end{bmatrix}$$

2. Estimate the relative error of the approximate solution $(1, 1)$ of the system $AX = b$ in the norms $|\cdot|_1$ and $|\cdot|_2$ using the condition number of the matrix A, where

$$A = \begin{pmatrix} -1.03 & -0.19 \\ 7.87 & -5.02 \end{pmatrix}, b = \begin{pmatrix} -0.89 \\ 2.99 \end{pmatrix}$$

3. Solve the system approximately and estimate the error of the solution in the norms $|\cdot|_1, |\cdot|_2, |\cdot|_\infty$:

$$\begin{cases} -(-2 + \varepsilon_1)x + 2(-4 + \varepsilon_2)y = 1 + \varepsilon_3 \\ 3x + (-1 + \varepsilon_1)y = -3 + \varepsilon_4, \end{cases}$$

   where the unknown numbers ε_j satisfy the conditions $|\varepsilon_j| < 0.05$ for all $j = 1, \ldots, 4$.

4. Find the approximate inverse matrix to the matrix A and evaluate the approximation error with respect to the uniform norm $\|\cdot\|_1$ if the elements of the matrix A are known with an absolute error of 0.01:

$$A \approx \begin{pmatrix} -8 & 9 \\ 3 & -3 \end{pmatrix}$$

5. Use simple iteration method for finding the solution of the given linear system

$$\begin{cases} 22x + 2y + 2z = 4, \\ 4x + 26y + 6z = 6, \\ 9x + 2y + 21z = 6. \end{cases}$$

   Determine the iteration number after which the approximation error for each coordinate does not exceed 0.01 and find the corresponding approximate solution. Start with $x_0 = [0, 0, 0]^T$.

6. Find the most influential vertex in the graph using the PageRank algorithm with $\beta = 0.15$, where the graph adjacency matrix is defined as follows

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

7. Find the value $f(A)$ of the function $f(l) = e^{l+2}$, where

$$A = \begin{pmatrix} -17 & 5 & -4 \\ -60 & 17 & -14 \\ 24 & -7 & 6 \end{pmatrix}$$

Variant 12

1. Find the best approximation matrix A_1 of rank 2 of the matrix A in the norm $||\cdot||_2$ and find $||A - A_1||_2$, where

$$A = \begin{bmatrix} -74 & -14 & 57 & 12 \\ 70 & -44 & -6 & -24 \\ -28 & 8 & -102 & -30 \end{bmatrix}$$

2. Estimate the relative error of the approximate solution $(1, 1)$ of the system $AX = b$ in the norms $|\cdot|_1$ and $|\cdot|_2$ using the condition number of the matrix A, where

$$A = \begin{pmatrix} -4.03 & -0.14 \\ -2.12 & -6.19 \end{pmatrix}, b = \begin{pmatrix} -4.1 \\ -7.93 \end{pmatrix}$$

3. Solve the system approximately and estimate the error of the solution in the norms $|\cdot|_1, |\cdot|_2, |\cdot|_\infty$:

$$\begin{cases} -4(-4 + \varepsilon_1)x + 4(1 + \varepsilon_2)y = -3 + \varepsilon_3 \\ 2x + (2 + \varepsilon_1)y = 1 + \varepsilon_4, \end{cases}$$

   where the unknown numbers ε_j satisfy the conditions $|\varepsilon_j| < 0.05$ for all $j = 1, \ldots, 4$.

4. Find the approximate inverse matrix to the matrix A and evaluate the approximation error with respect to the uniform norm $\|\cdot\|_1$ if the elements of the matrix A are known with an absolute error of 0.01:

$$A \approx \begin{pmatrix} -1 & 5 \\ -8 & 7 \end{pmatrix}$$

5. Use simple iteration method for finding the solution of the given linear system

$$\begin{cases} 24x + 7y + 4z = 2, \\ 4x + 23y + 5z = 7, \\ 4x + 8y + 26z = 5. \end{cases}$$

   Determine the iteration number after which the approximation error for each coordinate does not exceed 0.01 and find the corresponding approximate solution. Start with $x_0 = [0, 0, 0]^T$.

6. Find the most influential vertex in the graph using the PageRank algorithm with $\beta = 0.15$, where the graph adjacency matrix is defined as follows

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

7. Find the value $f(A)$ of the function $f(l) = ln(l + 2)$, where

$$A = \begin{pmatrix} -5 & -5 & 4 \\ 8 & 7 & -4 \\ 0 & -1 & 3 \end{pmatrix}$$

Variant 13

1. Find the best approximation matrix A_1 of rank 2 of the matrix A in the norm $||\cdot||_2$ and find $||A - A_1||_2$, where

$$A = \begin{bmatrix} 3 & -6 & 10 & -58 \\ 30 & 48 & -26 & 38 \\ -66 & -30 & -31 & -14 \end{bmatrix}$$

2. Estimate the relative error of the approximate solution $(1, 1)$ of the system $AX = b$ in the norms $|\cdot|_1$ and $|\cdot|_2$ using the condition number of the matrix A, where

$$A = \begin{pmatrix} 4.08 & 0.11 \\ -0.92 & -2.91 \end{pmatrix}, b = \begin{pmatrix} 4.13 \\ -3.96 \end{pmatrix}$$

3. Solve the system approximately and estimate the error of the solution in the norms $|\cdot|_1, |\cdot|_2, |\cdot|_\infty$:

$$\begin{cases} 4(-2 + \varepsilon_1)x + 4(-4 + \varepsilon_2)y = -2 + \varepsilon_3 \\ 4x + (-5 + \varepsilon_1)y = -5 + \varepsilon_4, \end{cases}$$

   where the unknown numbers ε_j satisfy the conditions $|\varepsilon_j| < 0.05$ for all $j = 1, \ldots, 4$.

4. Find the approximate inverse matrix to the matrix A and evaluate the approximation error with respect to the uniform norm $\|\cdot\|_1$ if the elements of the matrix A are known with an absolute error of 0.01:

$$A \approx \begin{pmatrix} 1 & 4 \\ 4 & 0 \end{pmatrix}$$

5. Use simple iteration method for finding the solution of the given linear system

$$\begin{cases} 20x + 2y + 3z = 3, \\ 1x + 26y + 9z = 3, \\ 4x + 6y + 20z = 6. \end{cases}$$

   Determine the iteration number after which the approximation error for each coordinate does not exceed 0.01 and find the corresponding approximate solution. Start with $x_0 = [0, 0, 0]^T$.

6. Find the most influential vertex in the graph using the PageRank algorithm with $\beta = 0.15$, where the graph adjacency matrix is defined as follows

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

7. Find the value $f(A)$ of the function $f(l) = ln(l + 3)$, where

$$A = \begin{pmatrix} -27 & -8 & 7 \\ 45 & 14 & -11 \\ -87 & -24 & 23 \end{pmatrix}$$

Variant 14

1. Find the best approximation matrix A_1 of rank 2 of the matrix A in the norm $||\cdot||_2$ and find $||A - A_1||_2$, where

$$A = \begin{bmatrix} -12 & -38 & -84 & -64 \\ 30 & 14 & 48 & -80 \\ 84 & -31 & -6 & 58 \end{bmatrix}$$

2. Estimate the relative error of the approximate solution $(1, 1)$ of the system $AX = b$ in the norms $|\cdot|_1$ and $|\cdot|_2$ using the condition number of the matrix A, where

$$A = \begin{pmatrix} 1.0 & -0.1 \\ 1.81 & -4.03 \end{pmatrix}, b = \begin{pmatrix} 1.19 \\ -1.98 \end{pmatrix}$$

3. Solve the system approximately and estimate the error of the solution in the norms $|\cdot|_1, |\cdot|_2, |\cdot|_\infty$:

$$\begin{cases} (6 + \varepsilon_1)x + 4(1 + \varepsilon_2)y = -1 + \varepsilon_3 \\ 2x + (-4 + \varepsilon_1)y = 4 + \varepsilon_4, \end{cases}$$

   where the unknown numbers ε_j satisfy the conditions $|\varepsilon_j| < 0.05$ for all $j = 1, \ldots, 4$.

4. Find the approximate inverse matrix to the matrix A and evaluate the approximation error with respect to the uniform norm $\|\cdot\|_1$ if the elements of the matrix A are known with an absolute error of 0.01:

$$A \approx \begin{pmatrix} -4 & 1 \\ -6 & -6 \end{pmatrix}$$

5. Use simple iteration method for finding the solution of the given linear system

$$\begin{cases} 23x + 3y + 1z = 5, \\ 9x + 21y + 5z = 8, \\ 5x + 2y + 25z = 8. \end{cases}$$

   Determine the iteration number after which the approximation error for each coordinate does not exceed 0.01 and find the corresponding approximate solution. Start with $x_0 = [0, 0, 0]^T$.

6. Find the most influential vertex in the graph using the PageRank algorithm with $\beta = 0.15$, where the graph adjacency matrix is defined as follows

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

7. Find the value $f(A)$ of the function $f(l) = ln(l + 5)$, where

$$A = \begin{pmatrix} 33 & -21 & 11 \\ 17 & -10 & 6 \\ -47 & 31 & -15 \end{pmatrix}$$

Variant 15

1. Find the best approximation matrix A_1 of rank 2 of the matrix A in the norm $||\cdot||_2$ and find $||A - A_1||_2$, where

$$A = \begin{bmatrix} 2 & -76 & 54 & 32 \\ 25 & -20 & -102 & -44 \\ -46 & 68 & -3 & -28 \end{bmatrix}$$

2. Estimate the relative error of the approximate solution $(1, 1)$ of the system $AX = b$ in the norms $|\cdot|_1$ and $|\cdot|_2$ using the condition number of the matrix A, where

$$A = \begin{pmatrix} 2.92 & -0.08 \\ 7.17 & -4.01 \end{pmatrix}, b = \begin{pmatrix} 3.09 \\ 3.05 \end{pmatrix}$$

3. Solve the system approximately and estimate the error of the solution in the norms $|\cdot|_1, |\cdot|_2, |\cdot|_\infty$:

$$\begin{cases} 3(2 + \varepsilon_1)x + 4(-2 + \varepsilon_2)y = -3 + \varepsilon_3 \\ -2x + (3 + \varepsilon_1)y = -3 + \varepsilon_4, \end{cases}$$

   where the unknown numbers ε_j satisfy the conditions $|\varepsilon_j| < 0.05$ for all $j = 1, \ldots, 4$.

4. Find the approximate inverse matrix to the matrix A and evaluate the approximation error with respect to the uniform norm $\|\cdot\|_1$ if the elements of the matrix A are known with an absolute error of 0.01:

$$A \approx \begin{pmatrix} -8 & 2 \\ 4 & -9 \end{pmatrix}$$

5. Use simple iteration method for finding the solution of the given linear system

$$\begin{cases} 26x + 2y + 6z = 6, \\ 9x + 21y + 2z = 3, \\ 8x + 3y + 23z = 3. \end{cases}$$

   Determine the iteration number after which the approximation error for each coordinate does not exceed 0.01 and find the corresponding approximate solution. Start with $x_0 = [0, 0, 0]^T$.

6. Find the most influential vertex in the graph using the PageRank algorithm with $\beta = 0.15$, where the graph adjacency matrix is defined as follows

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

7. Find the value $f(A)$ of the function $f(l) = e^{l+1}$, where

$$A = \begin{pmatrix} 28 & -11 & -5 \\ 39 & -15 & -7 \\ 42 & -17 & -7 \end{pmatrix}$$

Variant 16

1. Find the best approximation matrix A_1 of rank 2 of the matrix A in the norm $||\cdot||_2$ and find $||A - A_1||_2$, where

$$A = \begin{bmatrix} -49 & 60 & 56 & 46 \\ 86 & -48 & 14 & -68 \\ -92 & -78 & -59 & 44 \end{bmatrix}$$

2. Estimate the relative error of the approximate solution $(1, 1)$ of the system $AX = b$ in the norms $|\cdot|_1$ and $|\cdot|_2$ using the condition number of the matrix A, where

$$A = \begin{pmatrix} -1.03 & -0.04 \\ -4.06 & -8.98 \end{pmatrix}, b = \begin{pmatrix} -0.94 \\ -12.97 \end{pmatrix}$$

3. Solve the system approximately and estimate the error of the solution in the norms $|\cdot|_1, |\cdot|_2, |\cdot|_\infty$:

$$\begin{cases} -(-8 + \varepsilon_1)x + 3(-5 + \varepsilon_2)y = -1 + \varepsilon_3 \\ -4x + (3 + \varepsilon_1)y = 1 + \varepsilon_4, \end{cases}$$

   where the unknown numbers ε_j satisfy the conditions $|\varepsilon_j| < 0.05$ for all $j = 1, \ldots, 4$.

4. Find the approximate inverse matrix to the matrix A and evaluate the approximation error with respect to the uniform norm $\|\cdot\|_1$ if the elements of the matrix A are known with an absolute error of 0.01:

$$A \approx \begin{pmatrix} -2 & 5 \\ 0 & -3 \end{pmatrix}$$

5. Use simple iteration method for finding the solution of the given linear system

$$\begin{cases} 21x + 4y + 3z = 5, \\ 8x + 23y + 6z = 3, \\ 7x + 1y + 19z = 1. \end{cases}$$

   Determine the iteration number after which the approximation error for each coordinate does not exceed 0.01 and find the corresponding approximate solution. Start with $x_0 = [0, 0, 0]^T$.

6. Find the most influential vertex in the graph using the PageRank algorithm with $\beta = 0.15$, where the graph adjacency matrix is defined as follows

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

7. Find the value $f(A)$ of the function $f(l) = e^{l+3}$, where

$$A = \begin{pmatrix} 7 & 1 & 0 \\ -22 & -2 & 1 \\ 10 & 2 & 2 \end{pmatrix}$$

Variant 17

1. Find the best approximation matrix A_1 of rank 2 of the matrix A in the norm $||\cdot||_2$ and find $||A - A_1||_2$, where

$$A = \begin{bmatrix} -38 & 0 & -20 & 30 \\ 13 & 18 & 52 & -24 \\ -4 & -36 & -46 & -39 \end{bmatrix}$$

2. Estimate the relative error of the approximate solution $(1, 1)$ of the system $AX = b$ in the norms $|\cdot|_1$ and $|\cdot|_2$ using the condition number of the matrix A, where

$$A = \begin{pmatrix} 3.0 & 0.05 \\ 6.88 & -3.16 \end{pmatrix}, b = \begin{pmatrix} 2.92 \\ 3.96 \end{pmatrix}$$

3. Solve the system approximately and estimate the error of the solution in the norms $|\cdot|_1, |\cdot|_2, |\cdot|_\infty$:

$$\begin{cases} 3(4 + \varepsilon_1)x + 4(-3 + \varepsilon_2)y = -4 + \varepsilon_3 \\ 1x + (-3 + \varepsilon_1)y = -5 + \varepsilon_4, \end{cases}$$

   where the unknown numbers ε_j satisfy the conditions $|\varepsilon_j| < 0.05$ for all $j = 1, \ldots, 4$.

4. Find the approximate inverse matrix to the matrix A and evaluate the approximation error with respect to the uniform norm $\|\cdot\|_1$ if the elements of the matrix A are known with an absolute error of 0.01:

$$A \approx \begin{pmatrix} 0 & 2 \\ -4 & -2 \end{pmatrix}$$

5. Use simple iteration method for finding the solution of the given linear system

$$\begin{cases} 26x + 2y + 6z = 6, \\ 2x + 26y + 8z = 5, \\ 7x + 4y + 26z = 1. \end{cases}$$

   Determine the iteration number after which the approximation error for each coordinate does not exceed 0.01 and find the corresponding approximate solution. Start with $x_0 = [0, 0, 0]^T$.

6. Find the most influential vertex in the graph using the PageRank algorithm with $\beta = 0.15$, where the graph adjacency matrix is defined as follows

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

7. Find the value $f(A)$ of the function $f(l) = e^{l+3}$, where

$$A = \begin{pmatrix} -2 & 4 & 3 \\ 12 & -8 & -8 \\ -24 & 20 & 18 \end{pmatrix}$$

Variant 18

1. Find the best approximation matrix A_1 of rank 2 of the matrix A in the norm $||\cdot||_2$ and find $||A - A_1||_2$, where

$$A = \begin{bmatrix} 72 & -86 & 2 & -11 \\ 0 & 88 & -88 & 22 \\ -36 & -4 & 46 & -130 \end{bmatrix}$$

2. Estimate the relative error of the approximate solution $(1, 1)$ of the system $AX = b$ in the norms $|\cdot|_1$ and $|\cdot|_2$ using the condition number of the matrix A, where

$$A = \begin{pmatrix} 4.98 & 0.11 \\ 4.08 & -3.93 \end{pmatrix}, b = \begin{pmatrix} 5.11 \\ -0.04 \end{pmatrix}$$

3. Solve the system approximately and estimate the error of the solution in the norms $|\cdot|_1, |\cdot|_2, |\cdot|_\infty$:

$$\begin{cases} (6 + \varepsilon_1)x + 4(-1 + \varepsilon_2)y = -5 + \varepsilon_3 \\ 3x + (-1 + \varepsilon_1)y = -3 + \varepsilon_4, \end{cases}$$

   where the unknown numbers ε_j satisfy the conditions $|\varepsilon_j| < 0.05$ for all $j = 1, \ldots, 4$.

4. Find the approximate inverse matrix to the matrix A and evaluate the approximation error with respect to the uniform norm $\|\cdot\|_1$ if the elements of the matrix A are known with an absolute error of 0.01:

$$A \approx \begin{pmatrix} -4 & 5 \\ 7 & -2 \end{pmatrix}$$

5. Use simple iteration method for finding the solution of the given linear system

$$\begin{cases} 27x + 3y + 2z = 7, \\ 9x + 22y + 5z = 4, \\ 2x + 1y + 21z = 4. \end{cases}$$

   Determine the iteration number after which the approximation error for each coordinate does not exceed 0.01 and find the corresponding approximate solution. Start with $x_0 = [0, 0, 0]^T$.

6. Find the most influential vertex in the graph using the PageRank algorithm with $\beta = 0.15$, where the graph adjacency matrix is defined as follows

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

7. Find the value $f(A)$ of the function $f(l) = ln(l + 6)$, where

$$A = \begin{pmatrix} 8 & 27 & 7 \\ -3 & -13 & -4 \\ 9 & 45 & 14 \end{pmatrix}$$

Variant 19

1. Find the best approximation matrix A_1 of rank 2 of the matrix A in the norm $||\cdot||_2$ and find $||A - A_1||_2$, where

$$A = \begin{bmatrix} -72 & -44 & 2 & 18 \\ 36 & -34 & -29 & -72 \\ 54 & -20 & -28 & 45 \end{bmatrix}$$

2. Estimate the relative error of the approximate solution $(1, 1)$ of the system $AX = b$ in the norms $|\cdot|_1$ and $|\cdot|_2$ using the condition number of the matrix A, where

$$A = \begin{pmatrix} 0.91 & -0.11 \\ -4.89 & -2.02 \end{pmatrix}, b = \begin{pmatrix} 1.19 \\ -6.9 \end{pmatrix}$$

3. Solve the system approximately and estimate the error of the solution in the norms $|\cdot|_1, |\cdot|_2, |\cdot|_\infty$:

$$\begin{cases} (-10 + \varepsilon_1)x + 4(1 + \varepsilon_2)y = -3 + \varepsilon_3 \\ 4x + (-5 + \varepsilon_1)y = 4 + \varepsilon_4, \end{cases}$$

   where the unknown numbers ε_j satisfy the conditions $|\varepsilon_j| < 0.05$ for all $j = 1, \ldots, 4$.

4. Find the approximate inverse matrix to the matrix A and evaluate the approximation error with respect to the uniform norm $\|\cdot\|_1$ if the elements of the matrix A are known with an absolute error of 0.01:

$$A \approx \begin{pmatrix} -2 & 4 \\ -4 & -5 \end{pmatrix}$$

5. Use simple iteration method for finding the solution of the given linear system

$$\begin{cases} 20x + 2y + 2z = 3, \\ 6x + 19y + 6z = 5, \\ 2x + 2y + 26z = 4. \end{cases}$$

   Determine the iteration number after which the approximation error for each coordinate does not exceed 0.01 and find the corresponding approximate solution. Start with $x_0 = [0, 0, 0]^T$.

6. Find the most influential vertex in the graph using the PageRank algorithm with $\beta = 0.15$, where the graph adjacency matrix is defined as follows

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

7. Find the value $f(A)$ of the function $f(l) = ln(l + 2)$, where

$$A = \begin{pmatrix} 3 & -14 & -13 \\ 1 & -16 & -17 \\ -1 & 22 & 23 \end{pmatrix}$$

Variant 20

1. Find the best approximation matrix A_1 of rank 2 of the matrix A in the norm $||\cdot||_2$ and find $||A - A_1||_2$, where

$$A = \begin{bmatrix} 44 & -80 & -5 & -96 \\ 4 & 32 & -106 & 60 \\ -80 & 8 & 14 & -66 \end{bmatrix}$$

2. Estimate the relative error of the approximate solution $(1, 1)$ of the system $AX = b$ in the norms $|\cdot|_1$ and $|\cdot|_2$ using the condition number of the matrix A, where

$$A = \begin{pmatrix} 2.92 & -0.02 \\ 3.96 & -4.13 \end{pmatrix}, b = \begin{pmatrix} 3.11 \\ 0.02 \end{pmatrix}$$

3. Solve the system approximately and estimate the error of the solution in the norms $|\cdot|_1, |\cdot|_2, |\cdot|_\infty$:

$$\begin{cases} 3(2 + \varepsilon_1)x + 2(-5 + \varepsilon_2)y = 1 + \varepsilon_3 \\ 1x + (-3 + \varepsilon_1)y = -1 + \varepsilon_4, \end{cases}$$

   where the unknown numbers ε_j satisfy the conditions $|\varepsilon_j| < 0.05$ for all $j = 1, \ldots, 4$.

4. Find the approximate inverse matrix to the matrix A and evaluate the approximation error with respect to the uniform norm $\|\cdot\|_1$ if the elements of the matrix A are known with an absolute error of 0.01:

$$A \approx \begin{pmatrix} 8 & -8 \\ -8 & -8 \end{pmatrix}$$

5. Use simple iteration method for finding the solution of the given linear system

$$\begin{cases} 24x + 1y + 2z = 2, \\ 1x + 26y + 6z = 6, \\ 5x + 5y + 25z = 9. \end{cases}$$

   Determine the iteration number after which the approximation error for each coordinate does not exceed 0.01 and find the corresponding approximate solution. Start with $x_0 = [0, 0, 0]^T$.

6. Find the most influential vertex in the graph using the PageRank algorithm with $\beta = 0.15$, where the graph adjacency matrix is defined as follows

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

7. Find the value $f(A)$ of the function $f(l) = e^{l+1}$, where

$$A = \begin{pmatrix} -6 & 26 & 9 \\ -6 & 22 & 7 \\ 8 & -28 & -8 \end{pmatrix}$$

Variant 21

1. Find the best approximation matrix A_1 of rank 2 of the matrix A in the norm $||\cdot||_2$ and find $||A - A_1||_2$, where

$$A = \begin{bmatrix} -34 & -96 & -38 & -69 \\ 64 & -21 & 32 & -48 \\ -47 & 96 & -22 & 42 \end{bmatrix}$$

2. Estimate the relative error of the approximate solution $(1, 1)$ of the system $AX = b$ in the norms $|\cdot|_1$ and $|\cdot|_2$ using the condition number of the matrix A, where

$$A = \begin{pmatrix} -3.99 & -0.13 \\ -4.1 & -8.1 \end{pmatrix}, b = \begin{pmatrix} -4.04 \\ -12.01 \end{pmatrix}$$

3. Solve the system approximately and estimate the error of the solution in the norms $|\cdot|_1, |\cdot|_2, |\cdot|_\infty$:

$$\begin{cases} -4(-8 + \varepsilon_1)x + 3(-4 + \varepsilon_2)y = 1 + \varepsilon_3 \\ 3x + (4 + \varepsilon_1)y = 1 + \varepsilon_4, \end{cases}$$

   where the unknown numbers ε_j satisfy the conditions $|\varepsilon_j| < 0.05$ for all $j = 1, \ldots, 4$.

4. Find the approximate inverse matrix to the matrix A and evaluate the approximation error with respect to the uniform norm $\|\cdot\|_1$ if the elements of the matrix A are known with an absolute error of 0.01:

$$A \approx \begin{pmatrix} 3 & -6 \\ -8 & -5 \end{pmatrix}$$

5. Use simple iteration method for finding the solution of the given linear system

$$\begin{cases} 23x + 9y + 1z = 1, \\ 1x + 24y + 8z = 5, \\ 2x + 9y + 20z = 5. \end{cases}$$

   Determine the iteration number after which the approximation error for each coordinate does not exceed 0.01 and find the corresponding approximate solution. Start with $x_0 = [0, 0, 0]^T$.

6. Find the most influential vertex in the graph using the PageRank algorithm with $\beta = 0.15$, where the graph adjacency matrix is defined as follows

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

7. Find the value $f(A)$ of the function $f(l) = e^{l+2}$, where

$$A = \begin{pmatrix} 9 & 29 & -7 \\ -2 & -4 & 1 \\ -3 & -3 & 1 \end{pmatrix}$$

Variant 22

1. Find the best approximation matrix A_1 of rank 2 of the matrix A in the norm $||\cdot||_2$ and find $||A - A_1||_2$, where

$$A = \begin{bmatrix} 64 & 66 & -2 & -16 \\ -70 & -39 & -52 & -26 \\ -56 & -6 & 28 & 20 \end{bmatrix}$$

2. Estimate the relative error of the approximate solution $(1, 1)$ of the system $AX = b$ in the norms $|\cdot|_1$ and $|\cdot|_2$ using the condition number of the matrix A, where

$$A = \begin{pmatrix} -2.07 & 0.17 \\ 2.94 & -0.87 \end{pmatrix}, b = \begin{pmatrix} -1.98 \\ 2.03 \end{pmatrix}$$

3. Solve the system approximately and estimate the error of the solution in the norms $|\cdot|_1, |\cdot|_2, |\cdot|_\infty$:

$$\begin{cases} -2(8 + \varepsilon_1)x + 2(-4 + \varepsilon_2)y = -1 + \varepsilon_3 \\ -1x + (4 + \varepsilon_1)y = 3 + \varepsilon_4, \end{cases}$$

   where the unknown numbers ε_j satisfy the conditions $|\varepsilon_j| < 0.05$ for all $j = 1, \ldots, 4$.

4. Find the approximate inverse matrix to the matrix A and evaluate the approximation error with respect to the uniform norm $\|\cdot\|_1$ if the elements of the matrix A are known with an absolute error of 0.01:

$$A \approx \begin{pmatrix} -2 & -6 \\ -4 & 1 \end{pmatrix}$$

5. Use simple iteration method for finding the solution of the given linear system

$$\begin{cases} 26x + 6y + 1z = 8, \\ 8x + 22y + 1z = 3, \\ 6x + 1y + 25z = 1. \end{cases}$$

   Determine the iteration number after which the approximation error for each coordinate does not exceed 0.01 and find the corresponding approximate solution. Start with $x_0 = [0, 0, 0]^T$.

6. Find the most influential vertex in the graph using the PageRank algorithm with $\beta = 0.15$, where the graph adjacency matrix is defined as follows

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

7. Find the value $f(A)$ of the function $f(l) = e^{l+2}$, where

$$A = \begin{pmatrix} 3 & -17 & 18 \\ -1 & 11 & -10 \\ -1 & 5 & -4 \end{pmatrix}$$

Variant 23

1. Find the best approximation matrix A_1 of rank 2 of the matrix A in the norm $||\cdot||_2$ and find $||A - A_1||_2$, where

$$A = \begin{bmatrix} -66 & 22 & 16 & 94 \\ 6 & 88 & -44 & -83 \\ -69 & -112 & -52 & -22 \end{bmatrix}$$

2. Estimate the relative error of the approximate solution $(1, 1)$ of the system $AX = b$ in the norms $|\cdot|_1$ and $|\cdot|_2$ using the condition number of the matrix A, where

$$A = \begin{pmatrix} 3.0 & -0.02 \\ -1.8 & -2.03 \end{pmatrix}, b = \begin{pmatrix} 2.8 \\ -3.91 \end{pmatrix}$$

3. Solve the system approximately and estimate the error of the solution in the norms $|\cdot|_1, |\cdot|_2, |\cdot|_\infty$:

$$\begin{cases} 3(-4 + \varepsilon_1)x + 2(3 + \varepsilon_2)y = -3 + \varepsilon_3 \\ 1x + (4 + \varepsilon_1)y = -3 + \varepsilon_4, \end{cases}$$

   where the unknown numbers ε_j satisfy the conditions $|\varepsilon_j| < 0.05$ for all $j = 1, \ldots, 4$.

4. Find the approximate inverse matrix to the matrix A and evaluate the approximation error with respect to the uniform norm $\|\cdot\|_1$ if the elements of the matrix A are known with an absolute error of 0.01:

$$A \approx \begin{pmatrix} 8 & -8 \\ 3 & -4 \end{pmatrix}$$

5. Use simple iteration method for finding the solution of the given linear system

$$\begin{cases} 20x + 7y + 2z = 1, \\ 3x + 23y + 2z = 9, \\ 5x + 3y + 22z = 3. \end{cases}$$

   Determine the iteration number after which the approximation error for each coordinate does not exceed 0.01 and find the corresponding approximate solution. Start with $x_0 = [0, 0, 0]^T$.

6. Find the most influential vertex in the graph using the PageRank algorithm with $\beta = 0.15$, where the graph adjacency matrix is defined as follows

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

7. Find the value $f(A)$ of the function $f(l) = ln(l + 6)$, where

$$A = \begin{pmatrix} -1 & 7 & 6 \\ -9 & 15 & 10 \\ 9 & -11 & -6 \end{pmatrix}$$

Variant 24

1. Find the best approximation matrix A_1 of rank 2 of the matrix A in the norm $||\cdot||_2$ and find $||A - A_1||_2$, where

$$A = \begin{bmatrix} -64 & 74 & -52 & 60 \\ 16 & -59 & -68 & -96 \\ 56 & 50 & 32 & -66 \end{bmatrix}$$

2. Estimate the relative error of the approximate solution $(1, 1)$ of the system $AX = b$ in the norms $|\cdot|_1$ and $|\cdot|_2$ using the condition number of the matrix A, where

$$A = \begin{pmatrix} -3.94 & -0.01 \\ -4.04 & -3.87 \end{pmatrix}, b = \begin{pmatrix} -3.85 \\ -8.08 \end{pmatrix}$$

3. Solve the system approximately and estimate the error of the solution in the norms $|\cdot|_1, |\cdot|_2, |\cdot|_\infty$:

$$\begin{cases} -4(-8 + \varepsilon_1)x + 2(1 + \varepsilon_2)y = -5 + \varepsilon_3 \\ -4x + (-5 + \varepsilon_1)y = -2 + \varepsilon_4, \end{cases}$$

   where the unknown numbers ε_j satisfy the conditions $|\varepsilon_j| < 0.05$ for all $j = 1, \ldots, 4$.

4. Find the approximate inverse matrix to the matrix A and evaluate the approximation error with respect to the uniform norm $\|\cdot\|_1$ if the elements of the matrix A are known with an absolute error of 0.01:

$$A \approx \begin{pmatrix} 9 & -1 \\ -6 & -4 \end{pmatrix}$$

5. Use simple iteration method for finding the solution of the given linear system

$$\begin{cases} 19x + 3y + 2z = 1, \\ 3x + 21y + 1z = 2, \\ 7x + 7y + 20z = 6. \end{cases}$$

   Determine the iteration number after which the approximation error for each coordinate does not exceed 0.01 and find the corresponding approximate solution. Start with $x_0 = [0, 0, 0]^T$.

6. Find the most influential vertex in the graph using the PageRank algorithm with $\beta = 0.15$, where the graph adjacency matrix is defined as follows

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

7. Find the value $f(A)$ of the function $f(l) = e^{l+1}$, where

$$A = \begin{pmatrix} 18 & -8 & -9 \\ 13 & -5 & -7 \\ 17 & -8 & -8 \end{pmatrix}$$

Variant 25

1. Find the best approximation matrix A_1 of rank 2 of the matrix A in the norm $||\cdot||_2$ and find $||A - A_1||_2$, where

$$A = \begin{bmatrix} 10 & -16 & -18 & -16 \\ -19 & -14 & 12 & 10 \\ 14 & 4 & -12 & 16 \end{bmatrix}$$

2. Estimate the relative error of the approximate solution $(1, 1)$ of the system $AX = b$ in the norms $|\cdot|_1$ and $|\cdot|_2$ using the condition number of the matrix A, where

$$A = \begin{pmatrix} -3.06 & -0.18 \\ 2.94 & -4.11 \end{pmatrix}, b = \begin{pmatrix} -2.93 \\ -1.02 \end{pmatrix}$$

3. Solve the system approximately and estimate the error of the solution in the norms $|\cdot|_1, |\cdot|_2, |\cdot|_\infty$:

$$\begin{cases} -3(8 + \varepsilon_1)x + 3(1 + \varepsilon_2)y = 3 + \varepsilon_3 \\ -2x + (1 + \varepsilon_1)y = 3 + \varepsilon_4, \end{cases}$$

   where the unknown numbers ε_j satisfy the conditions $|\varepsilon_j| < 0.05$ for all $j = 1, \ldots, 4$.

4. Find the approximate inverse matrix to the matrix A and evaluate the approximation error with respect to the uniform norm $\|\cdot\|_1$ if the elements of the matrix A are known with an absolute error of 0.01:

$$A \approx \begin{pmatrix} -8 & 5 \\ 1 & -7 \end{pmatrix}$$

5. Use simple iteration method for finding the solution of the given linear system

$$\begin{cases} 26x + 5y + 6z = 7, \\ 5x + 21y + 7z = 8, \\ 1x + 5y + 20z = 2. \end{cases}$$

   Determine the iteration number after which the approximation error for each coordinate does not exceed 0.01 and find the corresponding approximate solution. Start with $x_0 = [0, 0, 0]^T$.

6. Find the most influential vertex in the graph using the PageRank algorithm with $\beta = 0.15$, where the graph adjacency matrix is defined as follows

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

7. Find the value $f(A)$ of the function $f(l) = e^{l+3}$, where

$$A = \begin{pmatrix} 6 & -7 & -3 \\ 2 & -1 & -1 \\ -2 & 3 & 3 \end{pmatrix}$$

Variant 26

1. Find the best approximation matrix A_1 of rank 2 of the matrix A in the norm $||\cdot||_2$ and find $||A - A_1||_2$, where

$$A = \begin{bmatrix} -74 & 8 & 74 & 36 \\ -46 & 52 & -83 & -48 \\ -11 & -88 & -46 & -12 \end{bmatrix}$$

2. Estimate the relative error of the approximate solution $(1, 1)$ of the system $AX = b$ in the norms $|\cdot|_1$ and $|\cdot|_2$ using the condition number of the matrix A, where

$$A = \begin{pmatrix} -2.09 & -0.01 \\ -4.04 & -5.09 \end{pmatrix}, b = \begin{pmatrix} -1.97 \\ -9.02 \end{pmatrix}$$

3. Solve the system approximately and estimate the error of the solution in the norms $|\cdot|_1, |\cdot|_2, |\cdot|_\infty$:

$$\begin{cases} -2(-8 + \varepsilon_1)x + 4(-1 + \varepsilon_2)y = 3 + \varepsilon_3 \\ -3x + (-3 + \varepsilon_1)y = -1 + \varepsilon_4, \end{cases}$$

   where the unknown numbers ε_j satisfy the conditions $|\varepsilon_j| < 0.05$ for all $j = 1, \ldots, 4$.

4. Find the approximate inverse matrix to the matrix A and evaluate the approximation error with respect to the uniform norm $\|\cdot\|_1$ if the elements of the matrix A are known with an absolute error of 0.01:

$$A \approx \begin{pmatrix} 1 & -6 \\ -2 & 8 \end{pmatrix}$$

5. Use simple iteration method for finding the solution of the given linear system

$$\begin{cases} 26x + 2y + 7z = 5, \\ 9x + 25y + 7z = 9, \\ 3x + 1y + 27z = 7. \end{cases}$$

   Determine the iteration number after which the approximation error for each coordinate does not exceed 0.01 and find the corresponding approximate solution. Start with $x_0 = [0, 0, 0]^T$.

6. Find the most influential vertex in the graph using the PageRank algorithm with $\beta = 0.15$, where the graph adjacency matrix is defined as follows

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

7. Find the value $f(A)$ of the function $f(l) = e^{l+2}$, where

$$A = \begin{pmatrix} 6 & -13 & -4 \\ 0 & 3 & 1 \\ 0 & -4 & -1 \end{pmatrix}$$

Variant 27

1. Find the best approximation matrix A_1 of rank 2 of the matrix A in the norm $||\cdot||_2$ and find $||A - A_1||_2$, where

$$A = \begin{bmatrix} -44 & 3 & -14 & 8 \\ 14 & -36 & 8 & 1 \\ 8 & 30 & -10 & -14 \end{bmatrix}$$

2. Estimate the relative error of the approximate solution $(1, 1)$ of the system $AX = b$ in the norms $|\cdot|_1$ and $|\cdot|_2$ using the condition number of the matrix A, where

$$A = \begin{pmatrix} -2.1 & 0.16 \\ 6.02 & -3.84 \end{pmatrix}, b = \begin{pmatrix} -1.87 \\ 2.0 \end{pmatrix}$$

3. Solve the system approximately and estimate the error of the solution in the norms $|\cdot|_1, |\cdot|_2, |\cdot|_\infty$:

$$\begin{cases} -2(2 + \varepsilon_1)x + 3(3 + \varepsilon_2)y = -2 + \varepsilon_3 \\ -4x + (-4 + \varepsilon_1)y = -3 + \varepsilon_4, \end{cases}$$

   where the unknown numbers ε_j satisfy the conditions $|\varepsilon_j| < 0.05$ for all $j = 1, \ldots, 4$.

4. Find the approximate inverse matrix to the matrix A and evaluate the approximation error with respect to the uniform norm $\|\cdot\|_1$ if the elements of the matrix A are known with an absolute error of 0.01:

$$A \approx \begin{pmatrix} -2 & 8 \\ -1 & -7 \end{pmatrix}$$

5. Use simple iteration method for finding the solution of the given linear system

$$\begin{cases} 26x + 1y + 5z = 9, \\ 7x + 24y + 5z = 1, \\ 9x + 4y + 23z = 6. \end{cases}$$

   Determine the iteration number after which the approximation error for each coordinate does not exceed 0.01 and find the corresponding approximate solution. Start with $x_0 = [0, 0, 0]^T$.

6. Find the most influential vertex in the graph using the PageRank algorithm with $\beta = 0.15$, where the graph adjacency matrix is defined as follows

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

7. Find the value $f(A)$ of the function $f(l) = e^{l+2}$, where

$$A = \begin{pmatrix} 3 & 2 & -1 \\ 4 & -8 & 8 \\ 5 & -14 & 13 \end{pmatrix}$$

Variant 28

1. Find the best approximation matrix A_1 of rank 2 of the matrix A in the norm $||\cdot||_2$ and find $||A - A_1||_2$, where

$$A = \begin{bmatrix} 12 & -16 & -71 & -2 \\ -24 & 74 & 70 & 46 \\ -30 & -53 & -52 & -88 \end{bmatrix}$$

2. Estimate the relative error of the approximate solution $(1, 1)$ of the system $AX = b$ in the norms $|\cdot|_1$ and $|\cdot|_2$ using the condition number of the matrix A, where

$$A = \begin{pmatrix} 2.99 & -0.04 \\ -3.95 & -6.1 \end{pmatrix}, b = \begin{pmatrix} 3.16 \\ -10.01 \end{pmatrix}$$

3. Solve the system approximately and estimate the error of the solution in the norms $|\cdot|_1, |\cdot|_2, |\cdot|_\infty$:

$$\begin{cases} 3(-8 + \varepsilon_1)x + 2(1 + \varepsilon_2)y = -2 + \varepsilon_3 \\ -3x + (-5 + \varepsilon_1)y = -1 + \varepsilon_4, \end{cases}$$

   where the unknown numbers ε_j satisfy the conditions $|\varepsilon_j| < 0.05$ for all $j = 1, \ldots, 4$.

4. Find the approximate inverse matrix to the matrix A and evaluate the approximation error with respect to the uniform norm $\|\cdot\|_1$ if the elements of the matrix A are known with an absolute error of 0.01:

$$A \approx \begin{pmatrix} 1 & -9 \\ 5 & 1 \end{pmatrix}$$

5. Use simple iteration method for finding the solution of the given linear system

$$\begin{cases} 21x + 7y + 4z = 7, \\ 3x + 20y + 1z = 3, \\ 9x + 2y + 27z = 1. \end{cases}$$

   Determine the iteration number after which the approximation error for each coordinate does not exceed 0.01 and find the corresponding approximate solution. Start with $x_0 = [0, 0, 0]^T$.

6. Find the most influential vertex in the graph using the PageRank algorithm with $\beta = 0.15$, where the graph adjacency matrix is defined as follows

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

7. Find the value $f(A)$ of the function $f(l) = ln(l + 3)$, where

$$A = \begin{pmatrix} -8 & 5 & -4 \\ -42 & 23 & -17 \\ -30 & 14 & -9 \end{pmatrix}$$

Variant 29

1. Find the best approximation matrix A_1 of rank 2 of the matrix A in the norm $||\cdot||_2$ and find $||A - A_1||_2$, where

$$A = \begin{bmatrix} 16 & -72 & 48 & -11 \\ 53 & -18 & -30 & -112 \\ -74 & 81 & -6 & 40 \end{bmatrix}$$

2. Estimate the relative error of the approximate solution $(1, 1)$ of the system $AX = b$ in the norms $|\cdot|_1$ and $|\cdot|_2$ using the condition number of the matrix A, where

$$A = \begin{pmatrix} -4.98 & 0.08 \\ -1.99 & -0.9 \end{pmatrix}, b = \begin{pmatrix} -4.98 \\ -2.93 \end{pmatrix}$$

3. Solve the system approximately and estimate the error of the solution in the norms $|\cdot|_1, |\cdot|_2, |\cdot|_\infty$:

$$\begin{cases} -5(-4 + \varepsilon_1)x + 4(4 + \varepsilon_2)y = 3 + \varepsilon_3 \\ -2x + (-3 + \varepsilon_1)y = 1 + \varepsilon_4, \end{cases}$$

   where the unknown numbers ε_j satisfy the conditions $|\varepsilon_j| < 0.05$ for all $j = 1, \ldots, 4$.

4. Find the approximate inverse matrix to the matrix A and evaluate the approximation error with respect to the uniform norm $\|\cdot\|_1$ if the elements of the matrix A are known with an absolute error of 0.01:

$$A \approx \begin{pmatrix} -8 & 8 \\ 0 & 7 \end{pmatrix}$$

5. Use simple iteration method for finding the solution of the given linear system

$$\begin{cases} 19x + 8y + 2z = 2, \\ 4x + 22y + 1z = 9, \\ 2x + 2y + 26z = 4. \end{cases}$$

   Determine the iteration number after which the approximation error for each coordinate does not exceed 0.01 and find the corresponding approximate solution. Start with $x_0 = [0, 0, 0]^T$.

6. Find the most influential vertex in the graph using the PageRank algorithm with $\beta = 0.15$, where the graph adjacency matrix is defined as follows

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

7. Find the value $f(A)$ of the function $f(l) = e^{l+2}$, where

$$A = \begin{pmatrix} 1 & -4 & 3 \\ 1 & 8 & -5 \\ 1 & 4 & -1 \end{pmatrix}$$

Variant 30

1. Find the best approximation matrix A_1 of rank 2 of the matrix A in the norm $||\cdot||_2$ and find $||A - A_1||_2$, where

$$A = \begin{bmatrix} -22 & 28 & 60 & 62 \\ -17 & -10 & -96 & -14 \\ -10 & 4 & -12 & -64 \end{bmatrix}$$

2. Estimate the relative error of the approximate solution $(1, 1)$ of the system $AX = b$ in the norms $|\cdot|_1$ and $|\cdot|_2$ using the condition number of the matrix A, where

$$A = \begin{pmatrix} 5.09 & -0.03 \\ -3.96 & -1.94 \end{pmatrix}, b = \begin{pmatrix} 4.88 \\ -5.91 \end{pmatrix}$$

3. Solve the system approximately and estimate the error of the solution in the norms $|\cdot|_1, |\cdot|_2, |\cdot|_\infty$:

$$\begin{cases} -4(6 + \varepsilon_1)x + 3(-5 + \varepsilon_2)y = 2 + \varepsilon_3 \\ 4x + (1 + \varepsilon_1)y = 1 + \varepsilon_4, \end{cases}$$

   where the unknown numbers ε_j satisfy the conditions $|\varepsilon_j| < 0.05$ for all $j = 1, \ldots, 4$.

4. Find the approximate inverse matrix to the matrix A and evaluate the approximation error with respect to the uniform norm $\|\cdot\|_1$ if the elements of the matrix A are known with an absolute error of 0.01:

$$A \approx \begin{pmatrix} -8 & 0 \\ -9 & 1 \end{pmatrix}$$

5. Use simple iteration method for finding the solution of the given linear system

$$\begin{cases} 21x + 1y + 6z = 4, \\ 1x + 23y + 4z = 4, \\ 3x + 7y + 23z = 6. \end{cases}$$

   Determine the iteration number after which the approximation error for each coordinate does not exceed 0.01 and find the corresponding approximate solution. Start with $x_0 = [0, 0, 0]^T$.

6. Find the most influential vertex in the graph using the PageRank algorithm with $\beta = 0.15$, where the graph adjacency matrix is defined as follows

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

7. Find the value $f(A)$ of the function $f(l) = ln(l + 3)$, where

$$A = \begin{pmatrix} -1 & 1 & 0 \\ -11 & 6 & 1 \\ 3 & -1 & 2 \end{pmatrix}$$

Variant 31

1. Find the best approximation matrix A_1 of rank 2 of the matrix A in the norm $||\cdot||_2$ and find $||A - A_1||_2$, where

$$A = \begin{bmatrix} -18 & -4 & -8 & -44 \\ -6 & 10 & -40 & 8 \\ -21 & 28 & 26 & 14 \end{bmatrix}$$

2. Estimate the relative error of the approximate solution $(1, 1)$ of the system $AX = b$ in the norms $|\cdot|_1$ and $|\cdot|_2$ using the condition number of the matrix A, where

$$A = \begin{pmatrix} 1.04 & 0.02 \\ 3.19 & -8.86 \end{pmatrix}, b = \begin{pmatrix} 0.93 \\ -6.09 \end{pmatrix}$$

3. Solve the system approximately and estimate the error of the solution in the norms $|\cdot|_1, |\cdot|_2, |\cdot|_\infty$:

$$\begin{cases} (8 + \varepsilon_1)x + 2(3 + \varepsilon_2)y = 4 + \varepsilon_3 \\ -5x + (-1 + \varepsilon_1)y = -4 + \varepsilon_4, \end{cases}$$

   where the unknown numbers ε_j satisfy the conditions $|\varepsilon_j| < 0.05$ for all $j = 1, \ldots, 4$.

4. Find the approximate inverse matrix to the matrix A and evaluate the approximation error with respect to the uniform norm $\|\cdot\|_1$ if the elements of the matrix A are known with an absolute error of 0.01:

$$A \approx \begin{pmatrix} 1 & -8 \\ -1 & 7 \end{pmatrix}$$

5. Use simple iteration method for finding the solution of the given linear system

$$\begin{cases} 26x + 4y + 4z = 7, \\ 3x + 21y + 8z = 8, \\ 3x + 3y + 19z = 2. \end{cases}$$

   Determine the iteration number after which the approximation error for each coordinate does not exceed 0.01 and find the corresponding approximate solution. Start with $x_0 = [0, 0, 0]^T$.

6. Find the most influential vertex in the graph using the PageRank algorithm with $\beta = 0.15$, where the graph adjacency matrix is defined as follows

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

7. Find the value $f(A)$ of the function $f(l) = e^{l+1}$, where

$$A = \begin{pmatrix} 6 & -1 & 2 \\ 11 & -6 & 6 \\ 9 & -9 & 7 \end{pmatrix}$$

Variant 32

1. Find the best approximation matrix A_1 of rank 2 of the matrix A in the norm $||\cdot||_2$ and find $||A - A_1||_2$, where

$$A = \begin{bmatrix} -6 & 14 & -54 & 24 \\ 48 & -13 & 72 & 6 \\ -30 & -20 & -63 & -60 \end{bmatrix}$$

2. Estimate the relative error of the approximate solution $(1, 1)$ of the system $AX = b$ in the norms $|\cdot|_1$ and $|\cdot|_2$ using the condition number of the matrix A, where

$$A = \begin{pmatrix} 3.98 & 0.02 \\ 5.11 & -2.06 \end{pmatrix}, b = \begin{pmatrix} 3.98 \\ 3.04 \end{pmatrix}$$

3. Solve the system approximately and estimate the error of the solution in the norms $|\cdot|_1, |\cdot|_2, |\cdot|_\infty$:

$$\begin{cases} 5(6 + \varepsilon_1)x + 3(-4 + \varepsilon_2)y = -1 + \varepsilon_3 \\ 4x + (-1 + \varepsilon_1)y = -5 + \varepsilon_4, \end{cases}$$

   where the unknown numbers ε_j satisfy the conditions $|\varepsilon_j| < 0.05$ for all $j = 1, \ldots, 4$.

4. Find the approximate inverse matrix to the matrix A and evaluate the approximation error with respect to the uniform norm $\|\cdot\|_1$ if the elements of the matrix A are known with an absolute error of 0.01:

$$A \approx \begin{pmatrix} -2 & 9 \\ 6 & 2 \end{pmatrix}$$

5. Use simple iteration method for finding the solution of the given linear system

$$\begin{cases} 20x + 6y + 3z = 1, \\ 4x + 20y + 4z = 3, \\ 9x + 2y + 25z = 5. \end{cases}$$

   Determine the iteration number after which the approximation error for each coordinate does not exceed 0.01 and find the corresponding approximate solution. Start with $x_0 = [0, 0, 0]^T$.

6. Find the most influential vertex in the graph using the PageRank algorithm with $\beta = 0.15$, where the graph adjacency matrix is defined as follows

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

7. Find the value $f(A)$ of the function $f(l) = ln(l + 3)$, where

$$A = \begin{pmatrix} 11 & 7 & 6 \\ 10 & 10 & 7 \\ -20 & -18 & -13 \end{pmatrix}$$

Variant 33

1. Find the best approximation matrix A_1 of rank 2 of the matrix A in the norm $||\cdot||_2$ and find $||A - A_1||_2$, where

$$A = \begin{bmatrix} -53 & -28 & -116 & -54 \\ -16 & -95 & 26 & 36 \\ 74 & 82 & 32 & -36 \end{bmatrix}$$

2. Estimate the relative error of the approximate solution $(1, 1)$ of the system $AX = b$ in the norms $|\cdot|_1$ and $|\cdot|_2$ using the condition number of the matrix A, where

$$A = \begin{pmatrix} 3.09 & -0.12 \\ -3.09 & -5.84 \end{pmatrix}, b = \begin{pmatrix} 2.83 \\ -9.08 \end{pmatrix}$$

3. Solve the system approximately and estimate the error of the solution in the norms $|\cdot|_1, |\cdot|_2, |\cdot|_\infty$:

$$\begin{cases} 3(-6 + \varepsilon_1)x + 3(-2 + \varepsilon_2)y = -1 + \varepsilon_3 \\ 2x + (2 + \varepsilon_1)y = -1 + \varepsilon_4, \end{cases}$$

   where the unknown numbers ε_j satisfy the conditions $|\varepsilon_j| < 0.05$ for all $j = 1, \ldots, 4$.

4. Find the approximate inverse matrix to the matrix A and evaluate the approximation error with respect to the uniform norm $\|\cdot\|_1$ if the elements of the matrix A are known with an absolute error of 0.01:

$$A \approx \begin{pmatrix} -3 & -2 \\ 3 & -7 \end{pmatrix}$$

5. Use simple iteration method for finding the solution of the given linear system

$$\begin{cases} 25x + 4y + 9z = 3, \\ 6x + 23y + 2z = 9, \\ 7x + 2y + 24z = 7. \end{cases}$$

   Determine the iteration number after which the approximation error for each coordinate does not exceed 0.01 and find the corresponding approximate solution. Start with $x_0 = [0, 0, 0]^T$.

6. Find the most influential vertex in the graph using the PageRank algorithm with $\beta = 0.15$, where the graph adjacency matrix is defined as follows

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

7. Find the value $f(A)$ of the function $f(l) = ln(l + 7)$, where

$$A = \begin{pmatrix} 28 & -13 & -7 \\ -13 & 8 & 3 \\ 114 & -56 & -28 \end{pmatrix}$$

Variant 34

1. Find the best approximation matrix A_1 of rank 2 of the matrix A in the norm $||\cdot||_2$ and find $||A - A_1||_2$, where

$$A = \begin{bmatrix} -30 & 16 & 2 & -10 \\ 9 & -28 & 16 & -2 \\ -12 & 2 & -17 & 16 \end{bmatrix}$$

2. Estimate the relative error of the approximate solution $(1, 1)$ of the system $AX = b$ in the norms $|\cdot|_1$ and $|\cdot|_2$ using the condition number of the matrix A, where

$$A = \begin{pmatrix} 2.06 & 0.05 \\ 1.83 & -4.05 \end{pmatrix}, b = \begin{pmatrix} 1.89 \\ -2.02 \end{pmatrix}$$

3. Solve the system approximately and estimate the error of the solution in the norms $|\cdot|_1, |\cdot|_2, |\cdot|_\infty$:

$$\begin{cases} 2(6 + \varepsilon_1)x + 3(1 + \varepsilon_2)y = -4 + \varepsilon_3 \\ -3x + (-2 + \varepsilon_1)y = 4 + \varepsilon_4, \end{cases}$$

   where the unknown numbers ε_j satisfy the conditions $|\varepsilon_j| < 0.05$ for all $j = 1, \ldots, 4$.

4. Find the approximate inverse matrix to the matrix A and evaluate the approximation error with respect to the uniform norm $\|\cdot\|_1$ if the elements of the matrix A are known with an absolute error of 0.01:

$$A \approx \begin{pmatrix} -9 & -5 \\ -9 & 6 \end{pmatrix}$$

5. Use simple iteration method for finding the solution of the given linear system

$$\begin{cases} 22x + 4y + 9z = 4, \\ 1x + 24y + 6z = 6, \\ 1x + 7y + 27z = 2. \end{cases}$$

   Determine the iteration number after which the approximation error for each coordinate does not exceed 0.01 and find the corresponding approximate solution. Start with $x_0 = [0, 0, 0]^T$.

6. Find the most influential vertex in the graph using the PageRank algorithm with $\beta = 0.15$, where the graph adjacency matrix is defined as follows

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

7. Find the value $f(A)$ of the function $f(l) = e^{l+2}$, where

$$A = \begin{pmatrix} 14 & 7 & -8 \\ -9 & -5 & 9 \\ 7 & 3 & -1 \end{pmatrix}$$

Variant 35

1. Find the best approximation matrix A_1 of rank 2 of the matrix A in the norm $||\cdot||_2$ and find $||A - A_1||_2$, where

$$A = \begin{bmatrix} 14 & -42 & 42 & 7 \\ -62 & -48 & -6 & 26 \\ -10 & 66 & 15 & -38 \end{bmatrix}$$

2. Estimate the relative error of the approximate solution $(1, 1)$ of the system $AX = b$ in the norms $|\cdot|_1$ and $|\cdot|_2$ using the condition number of the matrix A, where

$$A = \begin{pmatrix} -4.95 & 0.16 \\ -2.02 & -5.09 \end{pmatrix}, b = \begin{pmatrix} -5.17 \\ -7.02 \end{pmatrix}$$

3. Solve the system approximately and estimate the error of the solution in the norms $|\cdot|_1, |\cdot|_2, |\cdot|_\infty$:

$$\begin{cases} -5(-4 + \varepsilon_1)x + 2(-5 + \varepsilon_2)y = -1 + \varepsilon_3 \\ -1x + (-4 + \varepsilon_1)y = -3 + \varepsilon_4, \end{cases}$$

   where the unknown numbers ε_j satisfy the conditions $|\varepsilon_j| < 0.05$ for all $j = 1, \ldots, 4$.

4. Find the approximate inverse matrix to the matrix A and evaluate the approximation error with respect to the uniform norm $\|\cdot\|_1$ if the elements of the matrix A are known with an absolute error of 0.01:

$$A \approx \begin{pmatrix} 7 & -5 \\ 8 & 6 \end{pmatrix}$$

5. Use simple iteration method for finding the solution of the given linear system

$$\begin{cases} 21x + 4y + 7z = 6, \\ 4x + 22y + 9z = 7, \\ 1x + 4y + 22z = 4. \end{cases}$$

   Determine the iteration number after which the approximation error for each coordinate does not exceed 0.01 and find the corresponding approximate solution. Start with $x_0 = [0, 0, 0]^T$.

6. Find the most influential vertex in the graph using the PageRank algorithm with $\beta = 0.15$, where the graph adjacency matrix is defined as follows

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

7. Find the value $f(A)$ of the function $f(l) = ln(l + 2)$, where

$$A = \begin{pmatrix} 16 & 14 & 13 \\ -45 & -42 & -41 \\ 35 & 34 & 34 \end{pmatrix}$$

Variant 36

1. Find the best approximation matrix A_1 of rank 2 of the matrix A in the norm $||\cdot||_2$ and find $||A - A_1||_2$, where

$$A = \begin{bmatrix} 46 & -81 & 64 & -30 \\ -44 & 72 & 13 & 24 \\ -67 & 18 & -100 & -42 \end{bmatrix}$$

2. Estimate the relative error of the approximate solution $(1, 1)$ of the system $AX = b$ in the norms $|\cdot|_1$ and $|\cdot|_2$ using the condition number of the matrix A, where

$$A = \begin{pmatrix} -2.02 & 0.09 \\ -4.85 & -4.91 \end{pmatrix}, b = \begin{pmatrix} -2.18 \\ -10.03 \end{pmatrix}$$

3. Solve the system approximately and estimate the error of the solution in the norms $|\cdot|_1, |\cdot|_2, |\cdot|_\infty$:

$$\begin{cases} -2(-10 + \varepsilon_1)x + 2(4 + \varepsilon_2)y = -4 + \varepsilon_3 \\ -4x + (-4 + \varepsilon_1)y = -3 + \varepsilon_4, \end{cases}$$

   where the unknown numbers ε_j satisfy the conditions $|\varepsilon_j| < 0.05$ for all $j = 1, \ldots, 4$.

4. Find the approximate inverse matrix to the matrix A and evaluate the approximation error with respect to the uniform norm $\|\cdot\|_1$ if the elements of the matrix A are known with an absolute error of 0.01:

$$A \approx \begin{pmatrix} 5 & -6 \\ 7 & 4 \end{pmatrix}$$

5. Use simple iteration method for finding the solution of the given linear system

$$\begin{cases} 21x + 5y + 2z = 1, \\ 5x + 20y + 2z = 9, \\ 1x + 3y + 27z = 9. \end{cases}$$

   Determine the iteration number after which the approximation error for each coordinate does not exceed 0.01 and find the corresponding approximate solution. Start with $x_0 = [0, 0, 0]^T$.

6. Find the most influential vertex in the graph using the PageRank algorithm with $\beta = 0.15$, where the graph adjacency matrix is defined as follows

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

7. Find the value $f(A)$ of the function $f(l) = ln(l + 4)$, where

$$A = \begin{pmatrix} 8 & 2 & 1 \\ -4 & 0 & 0 \\ -12 & -4 & 0 \end{pmatrix}$$

Variant 37

1. Find the best approximation matrix A_1 of rank 2 of the matrix A in the norm $||\cdot||_2$ and find $||A - A_1||_2$, where

$$A = \begin{bmatrix} 60 & 54 & -3 & -118 \\ -96 & -108 & 30 & 22 \\ -66 & 0 & -66 & 44 \end{bmatrix}$$

2. Estimate the relative error of the approximate solution $(1, 1)$ of the system $AX = b$ in the norms $|\cdot|_1$ and $|\cdot|_2$ using the condition number of the matrix A, where

$$A = \begin{pmatrix} 2.92 & 0.07 \\ 8.06 & -5.18 \end{pmatrix}, b = \begin{pmatrix} 2.94 \\ 2.96 \end{pmatrix}$$

3. Solve the system approximately and estimate the error of the solution in the norms $|\cdot|_1, |\cdot|_2, |\cdot|_\infty$:

$$\begin{cases} 3(-2 + \varepsilon_1)x + 4(-2 + \varepsilon_2)y = -4 + \varepsilon_3 \\ -5x + (-4 + \varepsilon_1)y = -4 + \varepsilon_4, \end{cases}$$

   where the unknown numbers ε_j satisfy the conditions $|\varepsilon_j| < 0.05$ for all $j = 1, \ldots, 4$.

4. Find the approximate inverse matrix to the matrix A and evaluate the approximation error with respect to the uniform norm $\|\cdot\|_1$ if the elements of the matrix A are known with an absolute error of 0.01:

$$A \approx \begin{pmatrix} -9 & -5 \\ -1 & -7 \end{pmatrix}$$

5. Use simple iteration method for finding the solution of the given linear system

$$\begin{cases} 23x + 7y + 2z = 1, \\ 1x + 21y + 8z = 7, \\ 2x + 6y + 25z = 6. \end{cases}$$

   Determine the iteration number after which the approximation error for each coordinate does not exceed 0.01 and find the corresponding approximate solution. Start with $x_0 = [0, 0, 0]^T$.

6. Find the most influential vertex in the graph using the PageRank algorithm with $\beta = 0.15$, where the graph adjacency matrix is defined as follows

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

7. Find the value $f(A)$ of the function $f(l) = e^{l+1}$, where

$$A = \begin{pmatrix} 8 & 11 & 4 \\ -17 & -25 & -9 \\ 47 & 71 & 25 \end{pmatrix}$$

Variant 38

1. Find the best approximation matrix A_1 of rank 2 of the matrix A in the norm $||\cdot||_2$ and find $||A - A_1||_2$, where

$$A = \begin{bmatrix} -60 & -56 & 94 & -40 \\ -36 & -16 & -100 & 52 \\ -6 & 80 & 44 & -32 \end{bmatrix}$$

2. Estimate the relative error of the approximate solution $(1, 1)$ of the system $AX = b$ in the norms $|\cdot|_1$ and $|\cdot|_2$ using the condition number of the matrix A, where

$$A = \begin{pmatrix} -5.08 & -0.1 \\ -1.15 & -1.0 \end{pmatrix}, b = \begin{pmatrix} -5.02 \\ -2.01 \end{pmatrix}$$

3. Solve the system approximately and estimate the error of the solution in the norms $|\cdot|_1, |\cdot|_2, |\cdot|_\infty$:

$$\begin{cases} -5(-2 + \varepsilon_1)x + 2(-3 + \varepsilon_2)y = 1 + \varepsilon_3 \\ 2x + (-4 + \varepsilon_1)y = -1 + \varepsilon_4, \end{cases}$$

   where the unknown numbers ε_j satisfy the conditions $|\varepsilon_j| < 0.05$ for all $j = 1, \ldots, 4$.

4. Find the approximate inverse matrix to the matrix A and evaluate the approximation error with respect to the uniform norm $\|\cdot\|_1$ if the elements of the matrix A are known with an absolute error of 0.01:

$$A \approx \begin{pmatrix} -9 & 1 \\ -3 & -2 \end{pmatrix}$$

5. Use simple iteration method for finding the solution of the given linear system

$$\begin{cases} 20x + 2y + 6z = 3, \\ 3x + 27y + 4z = 2, \\ 7x + 8y + 27z = 9. \end{cases}$$

   Determine the iteration number after which the approximation error for each coordinate does not exceed 0.01 and find the corresponding approximate solution. Start with $x_0 = [0, 0, 0]^T$.

6. Find the most influential vertex in the graph using the PageRank algorithm with $\beta = 0.15$, where the graph adjacency matrix is defined as follows

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

7. Find the value $f(A)$ of the function $f(l) = ln(l + 6)$, where

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

Variant 39

1. Find the best approximation matrix A_1 of rank 2 of the matrix A in the norm $||\cdot||_2$ and find $||A - A_1||_2$, where

$$A = \begin{bmatrix} -82 & -11 & 12 & -30 \\ -20 & 2 & 42 & -24 \\ 70 & -10 & -48 & 12 \end{bmatrix}$$

2. Estimate the relative error of the approximate solution $(1, 1)$ of the system $AX = b$ in the norms $|\cdot|_1$ and $|\cdot|_2$ using the condition number of the matrix A, where

$$A = \begin{pmatrix} -4.96 & -0.13 \\ 5.07 & -3.18 \end{pmatrix}, b = \begin{pmatrix} -4.84 \\ 2.06 \end{pmatrix}$$

3. Solve the system approximately and estimate the error of the solution in the norms $|\cdot|_1, |\cdot|_2, |\cdot|_\infty$:

$$\begin{cases} -5(4 + \varepsilon_1)x + 2(3 + \varepsilon_2)y = 4 + \varepsilon_3 \\ -5x + (2 + \varepsilon_1)y = -4 + \varepsilon_4, \end{cases}$$

   where the unknown numbers ε_j satisfy the conditions $|\varepsilon_j| < 0.05$ for all $j = 1, \ldots, 4$.

4. Find the approximate inverse matrix to the matrix A and evaluate the approximation error with respect to the uniform norm $\|\cdot\|_1$ if the elements of the matrix A are known with an absolute error of 0.01:

$$A \approx \begin{pmatrix} -9 & 3 \\ 6 & 3 \end{pmatrix}$$

5. Use simple iteration method for finding the solution of the given linear system

$$\begin{cases} 19x + 1y + 3z = 1, \\ 9x + 23y + 9z = 5, \\ 1x + 3y + 24z = 5. \end{cases}$$

   Determine the iteration number after which the approximation error for each coordinate does not exceed 0.01 and find the corresponding approximate solution. Start with $x_0 = [0, 0, 0]^T$.

6. Find the most influential vertex in the graph using the PageRank algorithm with $\beta = 0.15$, where the graph adjacency matrix is defined as follows

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

7. Find the value $f(A)$ of the function $f(l) = e^{l+1}$, where

$$A = \begin{pmatrix} -11 & -10 & -9 \\ 30 & 25 & 21 \\ -16 & -12 & -9 \end{pmatrix}$$

Variant 40

1. Find the best approximation matrix A_1 of rank 2 of the matrix A in the norm $||\cdot||_2$ and find $||A - A_1||_2$, where

$$A = \begin{bmatrix} 117 & 26 & -78 & 66 \\ -126 & 56 & -42 & -6 \\ 18 & -2 & -3 & -174 \end{bmatrix}$$

2. Estimate the relative error of the approximate solution $(1, 1)$ of the system $AX = b$ in the norms $|\cdot|_1$ and $|\cdot|_2$ using the condition number of the matrix A, where

$$A = \begin{pmatrix} -5.04 & 0.03 \\ 6.89 & -8.05 \end{pmatrix}, b = \begin{pmatrix} -4.86 \\ -1.05 \end{pmatrix}$$

3. Solve the system approximately and estimate the error of the solution in the norms $|\cdot|_1, |\cdot|_2, |\cdot|_\infty$:

$$\begin{cases} -5(-8 + \varepsilon_1)x + 4(2 + \varepsilon_2)y = 3 + \varepsilon_3 \\ -4x + (4 + \varepsilon_1)y = 1 + \varepsilon_4, \end{cases}$$

   where the unknown numbers ε_j satisfy the conditions $|\varepsilon_j| < 0.05$ for all $j = 1, \ldots, 4$.

4. Find the approximate inverse matrix to the matrix A and evaluate the approximation error with respect to the uniform norm $\|\cdot\|_1$ if the elements of the matrix A are known with an absolute error of 0.01:

$$A \approx \begin{pmatrix} 0 & -8 \\ -5 & 4 \end{pmatrix}$$

5. Use simple iteration method for finding the solution of the given linear system

$$\begin{cases} 24x + 2y + 1z = 2, \\ 3x + 26y + 6z = 8, \\ 7x + 4y + 20z = 8. \end{cases}$$

   Determine the iteration number after which the approximation error for each coordinate does not exceed 0.01 and find the corresponding approximate solution. Start with $x_0 = [0, 0, 0]^T$.

6. Find the most influential vertex in the graph using the PageRank algorithm with $\beta = 0.15$, where the graph adjacency matrix is defined as follows

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

7. Find the value $f(A)$ of the function $f(l) = e^{l+2}$, where

$$A = \begin{pmatrix} 3 & -1 & 0 \\ 13 & -3 & -4 \\ -16 & 4 & 8 \end{pmatrix}$$

Variant 41

1. Find the best approximation matrix A_1 of rank 2 of the matrix A in the norm $||\cdot||_2$ and find $||A - A_1||_2$, where

$$A = \begin{bmatrix} 68 & 32 & -12 & -92 \\ -10 & -40 & -60 & 64 \\ -116 & -56 & 18 & -16 \end{bmatrix}$$

2. Estimate the relative error of the approximate solution $(1, 1)$ of the system $AX = b$ in the norms $|\cdot|_1$ and $|\cdot|_2$ using the condition number of the matrix A, where

$$A = \begin{pmatrix} 4.99 & -0.02 \\ -4.2 & -4.89 \end{pmatrix}, b = \begin{pmatrix} 4.88 \\ -9.08 \end{pmatrix}$$

3. Solve the system approximately and estimate the error of the solution in the norms $|\cdot|_1, |\cdot|_2, |\cdot|_\infty$:

$$\begin{cases} -4(-2 + \varepsilon_1)x + 2(1 + \varepsilon_2)y = -1 + \varepsilon_3 \\ 1x + (2 + \varepsilon_1)y = 1 + \varepsilon_4, \end{cases}$$

   where the unknown numbers ε_j satisfy the conditions $|\varepsilon_j| < 0.05$ for all $j = 1, \ldots, 4$.

4. Find the approximate inverse matrix to the matrix A and evaluate the approximation error with respect to the uniform norm $\|\cdot\|_1$ if the elements of the matrix A are known with an absolute error of 0.01:

$$A \approx \begin{pmatrix} 3 & 6 \\ -2 & -5 \end{pmatrix}$$

5. Use simple iteration method for finding the solution of the given linear system

$$\begin{cases} 24x + 2y + 9z = 1, \\ 1x + 20y + 4z = 5, \\ 4x + 7y + 23z = 2. \end{cases}$$

   Determine the iteration number after which the approximation error for each coordinate does not exceed 0.01 and find the corresponding approximate solution. Start with $x_0 = [0, 0, 0]^T$.

6. Find the most influential vertex in the graph using the PageRank algorithm with $\beta = 0.15$, where the graph adjacency matrix is defined as follows

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

7. Find the value $f(A)$ of the function $f(l) = e^{l+3}$, where

$$A = \begin{pmatrix} 46 & 23 & 11 \\ -65 & -32 & -16 \\ -30 & -16 & -6 \end{pmatrix}$$

Variant 42

1. Find the best approximation matrix A_1 of rank 2 of the matrix A in the norm $||\cdot||_2$ and find $||A - A_1||_2$, where

$$A = \begin{bmatrix} -72 & -48 & -78 & 6 \\ -48 & 36 & 84 & -6 \\ 48 & -12 & -36 & -69 \end{bmatrix}$$

2. Estimate the relative error of the approximate solution $(1, 1)$ of the system $AX = b$ in the norms $|\cdot|_1$ and $|\cdot|_2$ using the condition number of the matrix A, where

$$A = \begin{pmatrix} 2.95 & -0.06 \\ 8.17 & -4.85 \end{pmatrix}, b = \begin{pmatrix} 3.0 \\ 3.1 \end{pmatrix}$$

3. Solve the system approximately and estimate the error of the solution in the norms $|\cdot|_1, |\cdot|_2, |\cdot|_\infty$:

$$\begin{cases} 3(-2 + \varepsilon_1)x + 3(4 + \varepsilon_2)y = -2 + \varepsilon_3 \\ 1x + (4 + \varepsilon_1)y = -4 + \varepsilon_4, \end{cases}$$

   where the unknown numbers ε_j satisfy the conditions $|\varepsilon_j| < 0.05$ for all $j = 1, \ldots, 4$.

4. Find the approximate inverse matrix to the matrix A and evaluate the approximation error with respect to the uniform norm $\|\cdot\|_1$ if the elements of the matrix A are known with an absolute error of 0.01:

$$A \approx \begin{pmatrix} 0 & 4 \\ 9 & -7 \end{pmatrix}$$

5. Use simple iteration method for finding the solution of the given linear system

$$\begin{cases} 20x + 9y + 1z = 3, \\ 8x + 26y + 1z = 7, \\ 2x + 8y + 19z = 7. \end{cases}$$

   Determine the iteration number after which the approximation error for each coordinate does not exceed 0.01 and find the corresponding approximate solution. Start with $x_0 = [0, 0, 0]^T$.

6. Find the most influential vertex in the graph using the PageRank algorithm with $\beta = 0.15$, where the graph adjacency matrix is defined as follows

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

7. Find the value $f(A)$ of the function $f(l) = e^{l+3}$, where

$$A = \begin{pmatrix} 28 & -5 & -6 \\ 64 & -10 & -16 \\ 46 & -9 & -8 \end{pmatrix}$$

Variant 43

1. Find the best approximation matrix A_1 of rank 2 of the matrix A in the norm $||\cdot||_2$ and find $||A - A_1||_2$, where

$$A = \begin{bmatrix} -42 & -22 & -8 & 100 \\ -6 & -20 & -136 & -34 \\ -27 & -4 & 76 & -92 \end{bmatrix}$$

2. Estimate the relative error of the approximate solution $(1, 1)$ of the system $AX = b$ in the norms $|\cdot|_1$ and $|\cdot|_2$ using the condition number of the matrix A, where

$$A = \begin{pmatrix} 5.09 & -0.05 \\ 5.99 & -6.93 \end{pmatrix}, b = \begin{pmatrix} 5.16 \\ -1.04 \end{pmatrix}$$

3. Solve the system approximately and estimate the error of the solution in the norms $|\cdot|_1, |\cdot|_2, |\cdot|_\infty$:

$$\begin{cases} -3(-6 + \varepsilon_1)x + 2(4 + \varepsilon_2)y = -1 + \varepsilon_3 \\ 4x + (-2 + \varepsilon_1)y = -2 + \varepsilon_4, \end{cases}$$

   where the unknown numbers ε_j satisfy the conditions $|\varepsilon_j| < 0.05$ for all $j = 1, \ldots, 4$.

4. Find the approximate inverse matrix to the matrix A and evaluate the approximation error with respect to the uniform norm $\|\cdot\|_1$ if the elements of the matrix A are known with an absolute error of 0.01:

$$A \approx \begin{pmatrix} -2 & -2 \\ 0 & 9 \end{pmatrix}$$

5. Use simple iteration method for finding the solution of the given linear system

$$\begin{cases} 19x + 9y + 4z = 4, \\ 2x + 26y + 3z = 1, \\ 1x + 1y + 26z = 9. \end{cases}$$

   Determine the iteration number after which the approximation error for each coordinate does not exceed 0.01 and find the corresponding approximate solution. Start with $x_0 = [0, 0, 0]^T$.

6. Find the most influential vertex in the graph using the PageRank algorithm with $\beta = 0.15$, where the graph adjacency matrix is defined as follows

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

7. Find the value $f(A)$ of the function $f(l) = e^{l+2}$, where

$$A = \begin{pmatrix} -4 & 7 & 6 \\ -15 & 14 & 14 \\ 5 & -1 & -2 \end{pmatrix}$$

Variant 44

1. Find the best approximation matrix A_1 of rank 2 of the matrix A in the norm $||\cdot||_2$ and find $||A - A_1||_2$, where

$$A = \begin{bmatrix} 19 & -96 & 68 & 28 \\ 62 & -6 & -92 & -88 \\ -86 & 36 & -58 & 16 \end{bmatrix}$$

2. Estimate the relative error of the approximate solution $(1, 1)$ of the system $AX = b$ in the norms $|\cdot|_1$ and $|\cdot|_2$ using the condition number of the matrix A, where

$$A = \begin{pmatrix} 2.06 & -0.06 \\ 2.1 & -2.02 \end{pmatrix}, b = \begin{pmatrix} 2.1 \\ 0.06 \end{pmatrix}$$

3. Solve the system approximately and estimate the error of the solution in the norms $|\cdot|_1, |\cdot|_2, |\cdot|_\infty$:

$$\begin{cases} 2(6 + \varepsilon_1)x + 3(-3 + \varepsilon_2)y = 3 + \varepsilon_3 \\ 2x + (1 + \varepsilon_1)y = 3 + \varepsilon_4, \end{cases}$$

   where the unknown numbers ε_j satisfy the conditions $|\varepsilon_j| < 0.05$ for all $j = 1, \ldots, 4$.

4. Find the approximate inverse matrix to the matrix A and evaluate the approximation error with respect to the uniform norm $\|\cdot\|_1$ if the elements of the matrix A are known with an absolute error of 0.01:

$$A \approx \begin{pmatrix} -9 & 8 \\ -6 & 7 \end{pmatrix}$$

5. Use simple iteration method for finding the solution of the given linear system

$$\begin{cases} 24x + 3y + 6z = 8, \\ 1x + 21y + 5z = 2, \\ 6x + 3y + 19z = 6. \end{cases}$$

   Determine the iteration number after which the approximation error for each coordinate does not exceed 0.01 and find the corresponding approximate solution. Start with $x_0 = [0, 0, 0]^T$.

6. Find the most influential vertex in the graph using the PageRank algorithm with $\beta = 0.15$, where the graph adjacency matrix is defined as follows

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

7. Find the value $f(A)$ of the function $f(l) = ln(l + 7)$, where

$$A = \begin{pmatrix} -13 & -2 & -3 \\ 57 & 10 & 11 \\ 45 & 6 & 11 \end{pmatrix}$$

Variant 45

1. Find the best approximation matrix A_1 of rank 2 of the matrix A in the norm $||\cdot||_2$ and find $||A - A_1||_2$, where

$$A = \begin{bmatrix} -78 & 27 & -118 & -14 \\ -66 & -90 & 13 & 50 \\ 24 & -18 & 46 & -124 \end{bmatrix}$$

2. Estimate the relative error of the approximate solution $(1, 1)$ of the system $AX = b$ in the norms $|\cdot|_1$ and $|\cdot|_2$ using the condition number of the matrix A, where

$$A = \begin{pmatrix} 5.08 & 0.07 \\ -4.8 & -7.86 \end{pmatrix}, b = \begin{pmatrix} 5.08 \\ -12.97 \end{pmatrix}$$

3. Solve the system approximately and estimate the error of the solution in the norms $|\cdot|_1, |\cdot|_2, |\cdot|_\infty$:

$$\begin{cases} -5(-8 + \varepsilon_1)x + 2(3 + \varepsilon_2)y = 3 + \varepsilon_3 \\ -2x + (-5 + \varepsilon_1)y = -2 + \varepsilon_4, \end{cases}$$

   where the unknown numbers ε_j satisfy the conditions $|\varepsilon_j| < 0.05$ for all $j = 1, \ldots, 4$.

4. Find the approximate inverse matrix to the matrix A and evaluate the approximation error with respect to the uniform norm $\|\cdot\|_1$ if the elements of the matrix A are known with an absolute error of 0.01:

$$A \approx \begin{pmatrix} -3 & 7 \\ -1 & 8 \end{pmatrix}$$

5. Use simple iteration method for finding the solution of the given linear system

$$\begin{cases} 23x + 3y + 6z = 9, \\ 4x + 20y + 9z = 5, \\ 2x + 1y + 25z = 1. \end{cases}$$

   Determine the iteration number after which the approximation error for each coordinate does not exceed 0.01 and find the corresponding approximate solution. Start with $x_0 = [0, 0, 0]^T$.

6. Find the most influential vertex in the graph using the PageRank algorithm with $\beta = 0.15$, where the graph adjacency matrix is defined as follows

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

7. Find the value $f(A)$ of the function $f(l) = e^{l+3}$, where

$$A = \begin{pmatrix} 2 & 9 & -5 \\ 1 & 14 & -7 \\ 2 & 22 & -11 \end{pmatrix}$$

Variant 46

1. Find the best approximation matrix A_1 of rank 2 of the matrix A in the norm $||\cdot||_2$ and find $||A - A_1||_2$, where

$$A = \begin{bmatrix} -24 & 2 & 2 & -1 \\ 24 & 14 & -7 & 14 \\ -9 & -32 & -8 & -8 \end{bmatrix}$$

2. Estimate the relative error of the approximate solution $(1, 1)$ of the system $AX = b$ in the norms $|\cdot|_1$ and $|\cdot|_2$ using the condition number of the matrix A, where

$$A = \begin{pmatrix} 1.99 & 0.12 \\ -5.16 & -1.05 \end{pmatrix}, b = \begin{pmatrix} 1.88 \\ -5.93 \end{pmatrix}$$

3. Solve the system approximately and estimate the error of the solution in the norms $|\cdot|_1, |\cdot|_2, |\cdot|_\infty$:

$$\begin{cases} 2(-10 + \varepsilon_1)x + 3(4 + \varepsilon_2)y = 3 + \varepsilon_3 \\ -4x + (1 + \varepsilon_1)y = -2 + \varepsilon_4, \end{cases}$$

   where the unknown numbers ε_j satisfy the conditions $|\varepsilon_j| < 0.05$ for all $j = 1, \ldots, 4$.

4. Find the approximate inverse matrix to the matrix A and evaluate the approximation error with respect to the uniform norm $\|\cdot\|_1$ if the elements of the matrix A are known with an absolute error of 0.01:

$$A \approx \begin{pmatrix} -7 & -5 \\ -6 & -4 \end{pmatrix}$$

5. Use simple iteration method for finding the solution of the given linear system

$$\begin{cases} 22x + 8y + 1z = 6, \\ 5x + 23y + 5z = 5, \\ 5x + 1y + 20z = 1. \end{cases}$$

   Determine the iteration number after which the approximation error for each coordinate does not exceed 0.01 and find the corresponding approximate solution. Start with $x_0 = [0, 0, 0]^T$.

6. Find the most influential vertex in the graph using the PageRank algorithm with $\beta = 0.15$, where the graph adjacency matrix is defined as follows

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

7. Find the value $f(A)$ of the function $f(l) = e^{l+2}$, where

$$A = \begin{pmatrix} -11 & 5 & -3 \\ -46 & 20 & -11 \\ -22 & 9 & -4 \end{pmatrix}$$

Variant 47

1. Find the best approximation matrix A_1 of rank 2 of the matrix A in the norm $||\cdot||_2$ and find $||A - A_1||_2$, where

$$A = \begin{bmatrix} -3 & 8 & -64 & 104 \\ -126 & -26 & 40 & -44 \\ 30 & 68 & 8 & -82 \end{bmatrix}$$

2. Estimate the relative error of the approximate solution $(1, 1)$ of the system $AX = b$ in the norms $|\cdot|_1$ and $|\cdot|_2$ using the condition number of the matrix A, where

$$A = \begin{pmatrix} -3.08 & -0.05 \\ 2.99 & -5.01 \end{pmatrix}, b = \begin{pmatrix} -3.05 \\ -2.05 \end{pmatrix}$$

3. Solve the system approximately and estimate the error of the solution in the norms $|\cdot|_1, |\cdot|_2, |\cdot|_\infty$:

$$\begin{cases} -3(8 + \varepsilon_1)x + 4(-1 + \varepsilon_2)y = 1 + \varepsilon_3 \\ -2x + (-2 + \varepsilon_1)y = -5 + \varepsilon_4, \end{cases}$$

   where the unknown numbers ε_j satisfy the conditions $|\varepsilon_j| < 0.05$ for all $j = 1, \ldots, 4$.

4. Find the approximate inverse matrix to the matrix A and evaluate the approximation error with respect to the uniform norm $\|\cdot\|_1$ if the elements of the matrix A are known with an absolute error of 0.01:

$$A \approx \begin{pmatrix} 8 & -8 \\ 0 & 3 \end{pmatrix}$$

5. Use simple iteration method for finding the solution of the given linear system

$$\begin{cases} 22x + 6y + 6z = 4, \\ 3x + 22y + 5z = 2, \\ 3x + 9y + 27z = 1. \end{cases}$$

   Determine the iteration number after which the approximation error for each coordinate does not exceed 0.01 and find the corresponding approximate solution. Start with $x_0 = [0, 0, 0]^T$.

6. Find the most influential vertex in the graph using the PageRank algorithm with $\beta = 0.15$, where the graph adjacency matrix is defined as follows

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

7. Find the value $f(A)$ of the function $f(l) = e^{l+3}$, where

$$A = \begin{pmatrix} 5 & 1 & 0 \\ 9 & 8 & 9 \\ -9 & -5 & -4 \end{pmatrix}$$

Variant 48

1. Find the best approximation matrix A_1 of rank 2 of the matrix A in the norm $||\cdot||_2$ and find $||A - A_1||_2$, where

$$A = \begin{bmatrix} -43 & -24 & 44 & 14 \\ 26 & 66 & -28 & 8 \\ -20 & -57 & -50 & -44 \end{bmatrix}$$

2. Estimate the relative error of the approximate solution $(1, 1)$ of the system $AX = b$ in the norms $|\cdot|_1$ and $|\cdot|_2$ using the condition number of the matrix A, where

$$A = \begin{pmatrix} -4.05 & -0.14 \\ 5.19 & -7.94 \end{pmatrix}, b = \begin{pmatrix} -4.08 \\ -3.02 \end{pmatrix}$$

3. Solve the system approximately and estimate the error of the solution in the norms $|\cdot|_1, |\cdot|_2, |\cdot|_\infty$:

$$\begin{cases} -4(-8 + \varepsilon_1)x + 3(-4 + \varepsilon_2)y = -4 + \varepsilon_3 \\ 1x + (-3 + \varepsilon_1)y = -1 + \varepsilon_4, \end{cases}$$

   where the unknown numbers ε_j satisfy the conditions $|\varepsilon_j| < 0.05$ for all $j = 1, \ldots, 4$.

4. Find the approximate inverse matrix to the matrix A and evaluate the approximation error with respect to the uniform norm $\|\cdot\|_1$ if the elements of the matrix A are known with an absolute error of 0.01:

$$A \approx \begin{pmatrix} -3 & 9 \\ -5 & -7 \end{pmatrix}$$

5. Use simple iteration method for finding the solution of the given linear system

$$\begin{cases} 25x + 2y + 9z = 3, \\ 6x + 22y + 3z = 2, \\ 4x + 1y + 26z = 7. \end{cases}$$

   Determine the iteration number after which the approximation error for each coordinate does not exceed 0.01 and find the corresponding approximate solution. Start with $x_0 = [0, 0, 0]^T$.

6. Find the most influential vertex in the graph using the PageRank algorithm with $\beta = 0.15$, where the graph adjacency matrix is defined as follows

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

7. Find the value $f(A)$ of the function $f(l) = e^{l+2}$, where

$$A = \begin{pmatrix} 20 & -4 & -5 \\ 3 & 1 & -1 \\ 57 & -12 & -14 \end{pmatrix}$$

Variant 49

1. Find the best approximation matrix A_1 of rank 2 of the matrix A in the norm $||\cdot||_2$ and find $||A - A_1||_2$, where

$$A = \begin{bmatrix} 2 & 26 & -16 & 18 \\ -32 & -8 & -26 & -21 \\ 23 & -22 & 20 & -12 \end{bmatrix}$$

2. Estimate the relative error of the approximate solution $(1, 1)$ of the system $AX = b$ in the norms $|\cdot|_1$ and $|\cdot|_2$ using the condition number of the matrix A, where

$$A = \begin{pmatrix} 2.1 & 0.07 \\ -2.83 & -4.88 \end{pmatrix}, b = \begin{pmatrix} 1.82 \\ -8.0 \end{pmatrix}$$

3. Solve the system approximately and estimate the error of the solution in the norms $|\cdot|_1, |\cdot|_2, |\cdot|_\infty$:

$$\begin{cases} 2(-6 + \varepsilon_1)x + 2(-2 + \varepsilon_2)y = -3 + \varepsilon_3 \\ -2x + (-3 + \varepsilon_1)y = 3 + \varepsilon_4, \end{cases}$$

   where the unknown numbers ε_j satisfy the conditions $|\varepsilon_j| < 0.05$ for all $j = 1, \ldots, 4$.

4. Find the approximate inverse matrix to the matrix A and evaluate the approximation error with respect to the uniform norm $\|\cdot\|_1$ if the elements of the matrix A are known with an absolute error of 0.01:

$$A \approx \begin{pmatrix} 6 & -7 \\ -1 & -9 \end{pmatrix}$$

5. Use simple iteration method for finding the solution of the given linear system

$$\begin{cases} 20x + 3y + 7z = 3, \\ 3x + 20y + 1z = 4, \\ 3x + 5y + 24z = 4. \end{cases}$$

   Determine the iteration number after which the approximation error for each coordinate does not exceed 0.01 and find the corresponding approximate solution. Start with $x_0 = [0, 0, 0]^T$.

6. Find the most influential vertex in the graph using the PageRank algorithm with $\beta = 0.15$, where the graph adjacency matrix is defined as follows

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

7. Find the value $f(A)$ of the function $f(l) = e^{l+1}$, where

$$A = \begin{pmatrix} 0 & 7 & -6 \\ -1 & 16 & -14 \\ -1 & 11 & -9 \end{pmatrix}$$

Variant 50

1. Find the best approximation matrix A_1 of rank 2 of the matrix A in the norm $||\cdot||_2$ and find $||A - A_1||_2$, where

$$A = \begin{bmatrix} 8 & 0 & -74 & 74 \\ -4 & -72 & 100 & 26 \\ -116 & 36 & -52 & -11 \end{bmatrix}$$

2. Estimate the relative error of the approximate solution $(1, 1)$ of the system $AX = b$ in the norms $|\cdot|_1$ and $|\cdot|_2$ using the condition number of the matrix A, where

$$A = \begin{pmatrix} -1.04 & 0.04 \\ 4.98 & -7.06 \end{pmatrix}, b = \begin{pmatrix} -0.87 \\ -1.92 \end{pmatrix}$$

3. Solve the system approximately and estimate the error of the solution in the norms $|\cdot|_1, |\cdot|_2, |\cdot|_\infty$:

$$\begin{cases} 0(-6 + \varepsilon_1)x + 2(-5 + \varepsilon_2)y = 1 + \varepsilon_3 \\ 3x + (-4 + \varepsilon_1)y = -3 + \varepsilon_4, \end{cases}$$

   where the unknown numbers ε_j satisfy the conditions $|\varepsilon_j| < 0.05$ for all $j = 1, \ldots, 4$.

4. Find the approximate inverse matrix to the matrix A and evaluate the approximation error with respect to the uniform norm $\|\cdot\|_1$ if the elements of the matrix A are known with an absolute error of 0.01:

$$A \approx \begin{pmatrix} -4 & 5 \\ 1 & 1 \end{pmatrix}$$

5. Use simple iteration method for finding the solution of the given linear system

$$\begin{cases} 22x + 5y + 5z = 5, \\ 4x + 21y + 8z = 9, \\ 3x + 2y + 26z = 4. \end{cases}$$

   Determine the iteration number after which the approximation error for each coordinate does not exceed 0.01 and find the corresponding approximate solution. Start with $x_0 = [0, 0, 0]^T$.

6. Find the most influential vertex in the graph using the PageRank algorithm with $\beta = 0.15$, where the graph adjacency matrix is defined as follows

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

7. Find the value $f(A)$ of the function $f(l) = ln(l + 7)$, where

$$A = \begin{pmatrix} 54 & 18 & -17 \\ -64 & -20 & 21 \\ 80 & 28 & -24 \end{pmatrix}$$

Variant 51

1. Find the best approximation matrix A_1 of rank 2 of the matrix A in the norm $||\cdot||_2$ and find $||A - A_1||_2$, where

$$A = \begin{bmatrix} 31 & 20 & -24 & -68 \\ 14 & -50 & 0 & 56 \\ -34 & 4 & 12 & -40 \end{bmatrix}$$

2. Estimate the relative error of the approximate solution $(1, 1)$ of the system $AX = b$ in the norms $|\cdot|_1$ and $|\cdot|_2$ using the condition number of the matrix A, where

$$A = \begin{pmatrix} 2.91 & -0.15 \\ -2.01 & -3.95 \end{pmatrix}, b = \begin{pmatrix} 2.9 \\ -6.01 \end{pmatrix}$$

3. Solve the system approximately and estimate the error of the solution in the norms $|\cdot|_1, |\cdot|_2, |\cdot|_\infty$:

$$\begin{cases} 3(-4 + \varepsilon_1)x + 3(1 + \varepsilon_2)y = -3 + \varepsilon_3 \\ -2x + (-4 + \varepsilon_1)y = 1 + \varepsilon_4, \end{cases}$$

   where the unknown numbers ε_j satisfy the conditions $|\varepsilon_j| < 0.05$ for all $j = 1, \ldots, 4$.

4. Find the approximate inverse matrix to the matrix A and evaluate the approximation error with respect to the uniform norm $\|\cdot\|_1$ if the elements of the matrix A are known with an absolute error of 0.01:

$$A \approx \begin{pmatrix} 6 & 1 \\ -1 & 4 \end{pmatrix}$$

5. Use simple iteration method for finding the solution of the given linear system

$$\begin{cases} 20x + 2y + 5z = 2, \\ 3x + 25y + 7z = 6, \\ 3x + 5y + 26z = 8. \end{cases}$$

   Determine the iteration number after which the approximation error for each coordinate does not exceed 0.01 and find the corresponding approximate solution. Start with $x_0 = [0, 0, 0]^T$.

6. Find the most influential vertex in the graph using the PageRank algorithm with $\beta = 0.15$, where the graph adjacency matrix is defined as follows

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

7. Find the value $f(A)$ of the function $f(l) = e^{l+2}$, where

$$A = \begin{pmatrix} 5 & -1 & 0 \\ 13 & -3 & 2 \\ 9 & -4 & 5 \end{pmatrix}$$

Variant 52

1. Find the best approximation matrix A_1 of rank 2 of the matrix A in the norm $||\cdot||_2$ and find $||A - A_1||_2$, where

$$A = \begin{bmatrix} -34 & -52 & -64 & -96 \\ -20 & -44 & 16 & 108 \\ 28 & 70 & -56 & -24 \end{bmatrix}$$

2. Estimate the relative error of the approximate solution $(1, 1)$ of the system $AX = b$ in the norms $|\cdot|_1$ and $|\cdot|_2$ using the condition number of the matrix A, where

$$A = \begin{pmatrix} 4.09 & 0.05 \\ 4.85 & -1.15 \end{pmatrix}, b = \begin{pmatrix} 3.98 \\ 3.95 \end{pmatrix}$$

3. Solve the system approximately and estimate the error of the solution in the norms $|\cdot|_1, |\cdot|_2, |\cdot|_\infty$:

$$\begin{cases} 4(8 + \varepsilon_1)x + 3(-2 + \varepsilon_2)y = -2 + \varepsilon_3 \\ -3x + (2 + \varepsilon_1)y = -1 + \varepsilon_4, \end{cases}$$

   where the unknown numbers ε_j satisfy the conditions $|\varepsilon_j| < 0.05$ for all $j = 1, \ldots, 4$.

4. Find the approximate inverse matrix to the matrix A and evaluate the approximation error with respect to the uniform norm $\|\cdot\|_1$ if the elements of the matrix A are known with an absolute error of 0.01:

$$A \approx \begin{pmatrix} 6 & -2 \\ 3 & 4 \end{pmatrix}$$

5. Use simple iteration method for finding the solution of the given linear system

$$\begin{cases} 22x + 1y + 6z = 4, \\ 9x + 20y + 3z = 8, \\ 8x + 2y + 22z = 3. \end{cases}$$

   Determine the iteration number after which the approximation error for each coordinate does not exceed 0.01 and find the corresponding approximate solution. Start with $x_0 = [0, 0, 0]^T$.

6. Find the most influential vertex in the graph using the PageRank algorithm with $\beta = 0.15$, where the graph adjacency matrix is defined as follows

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

7. Find the value $f(A)$ of the function $f(l) = e^{l+1}$, where

$$A = \begin{pmatrix} 14 & 38 & 13 \\ -8 & -24 & -9 \\ 16 & 52 & 20 \end{pmatrix}$$

Variant 53

1. Find the best approximation matrix A_1 of rank 2 of the matrix A in the norm $||\cdot||_2$ and find $||A - A_1||_2$, where

$$A = \begin{bmatrix} 54 & -47 & 8 & 16 \\ -72 & 58 & 62 & -26 \\ 36 & -76 & -77 & -34 \end{bmatrix}$$

2. Estimate the relative error of the approximate solution $(1, 1)$ of the system $AX = b$ in the norms $|\cdot|_1$ and $|\cdot|_2$ using the condition number of the matrix A, where

$$A = \begin{pmatrix} 3.05 & -0.06 \\ 7.07 & -3.06 \end{pmatrix}, b = \begin{pmatrix} 3.09 \\ 3.97 \end{pmatrix}$$

3. Solve the system approximately and estimate the error of the solution in the norms $|\cdot|_1, |\cdot|_2, |\cdot|_\infty$:

$$\begin{cases} 4(4 + \varepsilon_1)x + 4(2 + \varepsilon_2)y = 1 + \varepsilon_3 \\ -3x + (-1 + \varepsilon_1)y = 2 + \varepsilon_4, \end{cases}$$

   where the unknown numbers ε_j satisfy the conditions $|\varepsilon_j| < 0.05$ for all $j = 1, \ldots, 4$.

4. Find the approximate inverse matrix to the matrix A and evaluate the approximation error with respect to the uniform norm $\|\cdot\|_1$ if the elements of the matrix A are known with an absolute error of 0.01:

$$A \approx \begin{pmatrix} 1 & -3 \\ -6 & 5 \end{pmatrix}$$

5. Use simple iteration method for finding the solution of the given linear system

$$\begin{cases} 19x + 5y + 4z = 5, \\ 2x + 24y + 8z = 8, \\ 6x + 4y + 25z = 7. \end{cases}$$

   Determine the iteration number after which the approximation error for each coordinate does not exceed 0.01 and find the corresponding approximate solution. Start with $x_0 = [0, 0, 0]^T$.

6. Find the most influential vertex in the graph using the PageRank algorithm with $\beta = 0.15$, where the graph adjacency matrix is defined as follows

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

7. Find the value $f(A)$ of the function $f(l) = e^{l+1}$, where

$$A = \begin{pmatrix} -22 & 19 & -4 \\ 7 & -5 & 1 \\ 203 & -169 & 35 \end{pmatrix}$$

Variant 54

1. Find the best approximation matrix A_1 of rank 2 of the matrix A in the norm $||\cdot||_2$ and find $||A - A_1||_2$, where

$$A = \begin{bmatrix} 88 & -30 & -53 & -52 \\ -94 & -6 & -10 & 64 \\ 41 & 48 & -4 & -38 \end{bmatrix}$$

2. Estimate the relative error of the approximate solution $(1, 1)$ of the system $AX = b$ in the norms $|\cdot|_1$ and $|\cdot|_2$ using the condition number of the matrix A, where

$$A = \begin{pmatrix} 1.92 & 0.14 \\ 2.8 & -5.96 \end{pmatrix}, b = \begin{pmatrix} 2.07 \\ -3.07 \end{pmatrix}$$

3. Solve the system approximately and estimate the error of the solution in the norms $|\cdot|_1, |\cdot|_2, |\cdot|_\infty$:

$$\begin{cases} 2(8 + \varepsilon_1)x + 4(1 + \varepsilon_2)y = -3 + \varepsilon_3 \\ -5x + (-5 + \varepsilon_1)y = -5 + \varepsilon_4, \end{cases}$$

   where the unknown numbers ε_j satisfy the conditions $|\varepsilon_j| < 0.05$ for all $j = 1, \ldots, 4$.

4. Find the approximate inverse matrix to the matrix A and evaluate the approximation error with respect to the uniform norm $\|\cdot\|_1$ if the elements of the matrix A are known with an absolute error of 0.01:

$$A \approx \begin{pmatrix} 1 & 1 \\ 9 & -1 \end{pmatrix}$$

5. Use simple iteration method for finding the solution of the given linear system

$$\begin{cases} 25x + 1y + 9z = 5, \\ 1x + 23y + 6z = 7, \\ 5x + 1y + 22z = 3. \end{cases}$$

   Determine the iteration number after which the approximation error for each coordinate does not exceed 0.01 and find the corresponding approximate solution. Start with $x_0 = [0, 0, 0]^T$.

6. Find the most influential vertex in the graph using the PageRank algorithm with $\beta = 0.15$, where the graph adjacency matrix is defined as follows

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

7. Find the value $f(A)$ of the function $f(l) = ln(l + 6)$, where

$$A = \begin{pmatrix} 14 & 4 & -3 \\ 3 & 1 & -1 \\ 39 & 12 & -8 \end{pmatrix}$$

Variant 55

1. Find the best approximation matrix A_1 of rank 2 of the matrix A in the norm $||\cdot||_2$ and find $||A - A_1||_2$, where

$$A = \begin{bmatrix} -38 & -82 & -25 & -48 \\ -34 & 85 & -14 & 24 \\ 53 & -26 & 22 & -36 \end{bmatrix}$$

2. Estimate the relative error of the approximate solution $(1, 1)$ of the system $AX = b$ in the norms $|\cdot|_1$ and $|\cdot|_2$ using the condition number of the matrix A, where

$$A = \begin{pmatrix} -3.08 & -0.06 \\ 3.03 & -3.12 \end{pmatrix}, b = \begin{pmatrix} -3.02 \\ 0.05 \end{pmatrix}$$

3. Solve the system approximately and estimate the error of the solution in the norms $|\cdot|_1, |\cdot|_2, |\cdot|_\infty$:

$$\begin{cases} -3(8 + \varepsilon_1)x + 4(-3 + \varepsilon_2)y = 2 + \varepsilon_3 \\ 3x + (3 + \varepsilon_1)y = -3 + \varepsilon_4, \end{cases}$$

   where the unknown numbers ε_j satisfy the conditions $|\varepsilon_j| < 0.05$ for all $j = 1, \ldots, 4$.

4. Find the approximate inverse matrix to the matrix A and evaluate the approximation error with respect to the uniform norm $\|\cdot\|_1$ if the elements of the matrix A are known with an absolute error of 0.01:

$$A \approx \begin{pmatrix} -2 & -9 \\ 4 & -6 \end{pmatrix}$$

5. Use simple iteration method for finding the solution of the given linear system

$$\begin{cases} 22x + 2y + 3z = 7, \\ 9x + 19y + 2z = 7, \\ 2x + 2y + 20z = 8. \end{cases}$$

   Determine the iteration number after which the approximation error for each coordinate does not exceed 0.01 and find the corresponding approximate solution. Start with $x_0 = [0, 0, 0]^T$.

6. Find the most influential vertex in the graph using the PageRank algorithm with $\beta = 0.15$, where the graph adjacency matrix is defined as follows

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

7. Find the value $f(A)$ of the function $f(l) = e^{l+3}$, where

$$A = \begin{pmatrix} 0 & 11 & -3 \\ 2 & -3 & 1 \\ 14 & -47 & 13 \end{pmatrix}$$

Variant 56

1. Find the best approximation matrix A_1 of rank 2 of the matrix A in the norm $||\cdot||_2$ and find $||A - A_1||_2$, where

$$A = \begin{bmatrix} -52 & -56 & -33 & -100 \\ -44 & 32 & -18 & 100 \\ 70 & -40 & 30 & -32 \end{bmatrix}$$

2. Estimate the relative error of the approximate solution $(1, 1)$ of the system $AX = b$ in the norms $|\cdot|_1$ and $|\cdot|_2$ using the condition number of the matrix A, where

$$A = \begin{pmatrix} 2.92 & 0.15 \\ -4.88 & -5.81 \end{pmatrix}, b = \begin{pmatrix} 2.94 \\ -10.92 \end{pmatrix}$$

3. Solve the system approximately and estimate the error of the solution in the norms $|\cdot|_1, |\cdot|_2, |\cdot|_\infty$:

$$\begin{cases} 3(-10 + \varepsilon_1)x + 4(-2 + \varepsilon_2)y = 2 + \varepsilon_3 \\ 4x + (-5 + \varepsilon_1)y = -2 + \varepsilon_4, \end{cases}$$

   where the unknown numbers ε_j satisfy the conditions $|\varepsilon_j| < 0.05$ for all $j = 1, \ldots, 4$.

4. Find the approximate inverse matrix to the matrix A and evaluate the approximation error with respect to the uniform norm $\|\cdot\|_1$ if the elements of the matrix A are known with an absolute error of 0.01:

$$A \approx \begin{pmatrix} 7 & -3 \\ 5 & -2 \end{pmatrix}$$

5. Use simple iteration method for finding the solution of the given linear system

$$\begin{cases} 22x + 9y + 1z = 8, \\ 2x + 21y + 9z = 1, \\ 7x + 2y + 20z = 1. \end{cases}$$

   Determine the iteration number after which the approximation error for each coordinate does not exceed 0.01 and find the corresponding approximate solution. Start with $x_0 = [0, 0, 0]^T$.

6. Find the most influential vertex in the graph using the PageRank algorithm with $\beta = 0.15$, where the graph adjacency matrix is defined as follows

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

7. Find the value $f(A)$ of the function $f(l) = e^{l+2}$, where

$$A = \begin{pmatrix} 9 & 14 & -5 \\ -8 & -15 & 6 \\ -16 & -32 & 13 \end{pmatrix}$$

Variant 57

1. Find the best approximation matrix A_1 of rank 2 of the matrix A in the norm $||\cdot||_2$ and find $||A - A_1||_2$, where

$$A = \begin{bmatrix} -78 & 28 & -17 & -32 \\ 18 & 8 & 38 & -52 \\ 3 & -40 & 2 & 68 \end{bmatrix}$$

2. Estimate the relative error of the approximate solution $(1, 1)$ of the system $AX = b$ in the norms $|\cdot|_1$ and $|\cdot|_2$ using the condition number of the matrix A, where

$$A = \begin{pmatrix} -4.93 & 0.02 \\ 0.86 & -3.06 \end{pmatrix}, b = \begin{pmatrix} -5.11 \\ -1.98 \end{pmatrix}$$

3. Solve the system approximately and estimate the error of the solution in the norms $|\cdot|_1, |\cdot|_2, |\cdot|_\infty$:

$$\begin{cases} -5(4 + \varepsilon_1)x + 3(2 + \varepsilon_2)y = 2 + \varepsilon_3 \\ 3x + (-5 + \varepsilon_1)y = 4 + \varepsilon_4, \end{cases}$$

   where the unknown numbers ε_j satisfy the conditions $|\varepsilon_j| < 0.05$ for all $j = 1, \ldots, 4$.

4. Find the approximate inverse matrix to the matrix A and evaluate the approximation error with respect to the uniform norm $\|\cdot\|_1$ if the elements of the matrix A are known with an absolute error of 0.01:

$$A \approx \begin{pmatrix} -5 & -1 \\ 3 & -1 \end{pmatrix}$$

5. Use simple iteration method for finding the solution of the given linear system

$$\begin{cases} 22x + 8y + 3z = 3, \\ 3x + 24y + 2z = 8, \\ 1x + 8y + 22z = 2. \end{cases}$$

   Determine the iteration number after which the approximation error for each coordinate does not exceed 0.01 and find the corresponding approximate solution. Start with $x_0 = [0, 0, 0]^T$.

6. Find the most influential vertex in the graph using the PageRank algorithm with $\beta = 0.15$, where the graph adjacency matrix is defined as follows

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

7. Find the value $f(A)$ of the function $f(l) = e^{l+2}$, where

$$A = \begin{pmatrix} 5 & -1 & -1 \\ 7 & -1 & -2 \\ -6 & 4 & 3 \end{pmatrix}$$

Variant 58

1. Find the best approximation matrix A_1 of rank 2 of the matrix A in the norm $||\cdot||_2$ and find $||A - A_1||_2$, where

$$A = \begin{bmatrix} 48 & 62 & -27 & 40 \\ -78 & -16 & 18 & -14 \\ 33 & -92 & -36 & -34 \end{bmatrix}$$

2. Estimate the relative error of the approximate solution $(1, 1)$ of the system $AX = b$ in the norms $|\cdot|_1$ and $|\cdot|_2$ using the condition number of the matrix A, where

$$A = \begin{pmatrix} 4.96 & -0.15 \\ 3.15 & -4.98 \end{pmatrix}, b = \begin{pmatrix} 5.0 \\ -2.06 \end{pmatrix}$$

3. Solve the system approximately and estimate the error of the solution in the norms $|\cdot|_1, |\cdot|_2, |\cdot|_\infty$:

$$\begin{cases} 4(-2 + \varepsilon_1)x + 4(4 + \varepsilon_2)y = 2 + \varepsilon_3 \\ 3x + (4 + \varepsilon_1)y = -5 + \varepsilon_4, \end{cases}$$

   where the unknown numbers ε_j satisfy the conditions $|\varepsilon_j| < 0.05$ for all $j = 1, \ldots, 4$.

4. Find the approximate inverse matrix to the matrix A and evaluate the approximation error with respect to the uniform norm $\|\cdot\|_1$ if the elements of the matrix A are known with an absolute error of 0.01:

$$A \approx \begin{pmatrix} 8 & 5 \\ 2 & 7 \end{pmatrix}$$

5. Use simple iteration method for finding the solution of the given linear system

$$\begin{cases} 25x + 3y + 2z = 3, \\ 8x + 26y + 8z = 4, \\ 3x + 5y + 22z = 5. \end{cases}$$

   Determine the iteration number after which the approximation error for each coordinate does not exceed 0.01 and find the corresponding approximate solution. Start with $x_0 = [0, 0, 0]^T$.

6. Find the most influential vertex in the graph using the PageRank algorithm with $\beta = 0.15$, where the graph adjacency matrix is defined as follows

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

7. Find the value $f(A)$ of the function $f(l) = ln(l + 4)$, where

$$A = \begin{pmatrix} -9 & 3 & -2 \\ -32 & 10 & -7 \\ 20 & -6 & 5 \end{pmatrix}$$

Variant 59

1. Find the best approximation matrix A_1 of rank 2 of the matrix A in the norm $||\cdot||_2$ and find $||A - A_1||_2$, where

$$A = \begin{bmatrix} -18 & -166 & -26 & -33 \\ -117 & 82 & -22 & 6 \\ 126 & 10 & 8 & -30 \end{bmatrix}$$

2. Estimate the relative error of the approximate solution $(1, 1)$ of the system $AX = b$ in the norms $|\cdot|_1$ and $|\cdot|_2$ using the condition number of the matrix A, where

$$A = \begin{pmatrix} 3.91 & 0.04 \\ -4.1 & -0.84 \end{pmatrix}, b = \begin{pmatrix} 3.97 \\ -4.96 \end{pmatrix}$$

3. Solve the system approximately and estimate the error of the solution in the norms $|\cdot|_1, |\cdot|_2, |\cdot|_\infty$:

$$\begin{cases} 4(-8 + \varepsilon_1)x + 3(4 + \varepsilon_2)y = 3 + \varepsilon_3 \\ -5x + (2 + \varepsilon_1)y = -1 + \varepsilon_4, \end{cases}$$

   where the unknown numbers ε_j satisfy the conditions $|\varepsilon_j| < 0.05$ for all $j = 1, \ldots, 4$.

4. Find the approximate inverse matrix to the matrix A and evaluate the approximation error with respect to the uniform norm $\|\cdot\|_1$ if the elements of the matrix A are known with an absolute error of 0.01:

$$A \approx \begin{pmatrix} 5 & 6 \\ 4 & -9 \end{pmatrix}$$

5. Use simple iteration method for finding the solution of the given linear system

$$\begin{cases} 27x + 1y + 9z = 4, \\ 8x + 23y + 5z = 1, \\ 1x + 7y + 25z = 2. \end{cases}$$

   Determine the iteration number after which the approximation error for each coordinate does not exceed 0.01 and find the corresponding approximate solution. Start with $x_0 = [0, 0, 0]^T$.

6. Find the most influential vertex in the graph using the PageRank algorithm with $\beta = 0.15$, where the graph adjacency matrix is defined as follows

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

7. Find the value $f(A)$ of the function $f(l) = e^{l+2}$, where

$$A = \begin{pmatrix} 5 & -10 & -3 \\ 0 & 3 & 1 \\ 0 & -4 & -1 \end{pmatrix}$$

Variant 60

1. Find the best approximation matrix A_1 of rank 2 of the matrix A in the norm $||\cdot||_2$ and find $||A - A_1||_2$, where

$$A = \begin{bmatrix} 0 & -32 & 22 & -11 \\ 18 & 17 & -28 & -4 \\ -18 & -10 & 8 & 14 \end{bmatrix}$$

2. Estimate the relative error of the approximate solution $(1, 1)$ of the system $AX = b$ in the norms $|\cdot|_1$ and $|\cdot|_2$ using the condition number of the matrix A, where

$$A = \begin{pmatrix} -1.05 & -0.19 \\ 8.06 & -9.14 \end{pmatrix}, b = \begin{pmatrix} -0.86 \\ -0.94 \end{pmatrix}$$

3. Solve the system approximately and estimate the error of the solution in the norms $|\cdot|_1, |\cdot|_2, |\cdot|_\infty$:

$$\begin{cases} -(-10 + \varepsilon_1)x + 4(4 + \varepsilon_2)y = 4 + \varepsilon_3 \\ -1x + (-3 + \varepsilon_1)y = -1 + \varepsilon_4, \end{cases}$$

   where the unknown numbers ε_j satisfy the conditions $|\varepsilon_j| < 0.05$ for all $j = 1, \ldots, 4$.

4. Find the approximate inverse matrix to the matrix A and evaluate the approximation error with respect to the uniform norm $\|\cdot\|_1$ if the elements of the matrix A are known with an absolute error of 0.01:

$$A \approx \begin{pmatrix} 2 & -4 \\ 0 & -9 \end{pmatrix}$$

5. Use simple iteration method for finding the solution of the given linear system

$$\begin{cases} 21x + 5y + 7z = 4, \\ 3x + 19y + 1z = 6, \\ 5x + 3y + 27z = 1. \end{cases}$$

   Determine the iteration number after which the approximation error for each coordinate does not exceed 0.01 and find the corresponding approximate solution. Start with $x_0 = [0, 0, 0]^T$.

6. Find the most influential vertex in the graph using the PageRank algorithm with $\beta = 0.15$, where the graph adjacency matrix is defined as follows

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

7. Find the value $f(A)$ of the function $f(l) = e^{l+2}$, where

$$A = \begin{pmatrix} 25 & -4 & 5 \\ 36 & -4 & 8 \\ -69 & 12 & -13 \end{pmatrix}$$

Variant 61

1. Find the best approximation matrix A_1 of rank 2 of the matrix A in the norm $||\cdot||_2$ and find $||A - A_1||_2$, where

$$A = \begin{bmatrix} 20 & -18 & -52 & 53 \\ -26 & -78 & -56 & -38 \\ -16 & 93 & 8 & -34 \end{bmatrix}$$

2. Estimate the relative error of the approximate solution $(1, 1)$ of the system $AX = b$ in the norms $|\cdot|_1$ and $|\cdot|_2$ using the condition number of the matrix A, where

$$A = \begin{pmatrix} 1.01 & -0.07 \\ 4.2 & -9.06 \end{pmatrix}, b = \begin{pmatrix} 0.84 \\ -5.02 \end{pmatrix}$$

3. Solve the system approximately and estimate the error of the solution in the norms $|\cdot|_1, |\cdot|_2, |\cdot|_\infty$:

$$\begin{cases} (-10 + \varepsilon_1)x + 2(2 + \varepsilon_2)y = -1 + \varepsilon_3 \\ -4x + (-4 + \varepsilon_1)y = -1 + \varepsilon_4, \end{cases}$$

   where the unknown numbers ε_j satisfy the conditions $|\varepsilon_j| < 0.05$ for all $j = 1, \ldots, 4$.

4. Find the approximate inverse matrix to the matrix A and evaluate the approximation error with respect to the uniform norm $\|\cdot\|_1$ if the elements of the matrix A are known with an absolute error of 0.01:

$$A \approx \begin{pmatrix} 5 & -8 \\ -9 & 8 \end{pmatrix}$$

5. Use simple iteration method for finding the solution of the given linear system

$$\begin{cases} 21x + 6y + 1z = 6, \\ 5x + 21y + 3z = 4, \\ 6x + 7y + 25z = 2. \end{cases}$$

   Determine the iteration number after which the approximation error for each coordinate does not exceed 0.01 and find the corresponding approximate solution. Start with $x_0 = [0, 0, 0]^T$.

6. Find the most influential vertex in the graph using the PageRank algorithm with $\beta = 0.15$, where the graph adjacency matrix is defined as follows

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

7. Find the value $f(A)$ of the function $f(l) = e^{l+1}$, where

$$A = \begin{pmatrix} 4 & 8 & -3 \\ -6 & -18 & 7 \\ -20 & -64 & 24 \end{pmatrix}$$

Variant 62

1. Find the best approximation matrix A_1 of rank 2 of the matrix A in the norm $||\cdot||_2$ and find $||A - A_1||_2$, where

$$A = \begin{bmatrix} -39 & -110 & 40 & 68 \\ -18 & 83 & -64 & 52 \\ 42 & -46 & 8 & -86 \end{bmatrix}$$

2. Estimate the relative error of the approximate solution $(1, 1)$ of the system $AX = b$ in the norms $|\cdot|_1$ and $|\cdot|_2$ using the condition number of the matrix A, where

$$A = \begin{pmatrix} -2.08 & -0.06 \\ 4.09 & -7.87 \end{pmatrix}, b = \begin{pmatrix} -2.18 \\ -4.01 \end{pmatrix}$$

3. Solve the system approximately and estimate the error of the solution in the norms $|\cdot|_1, |\cdot|_2, |\cdot|_\infty$:

$$\begin{cases} -2(-8 + \varepsilon_1)x + 2(-4 + \varepsilon_2)y = 3 + \varepsilon_3 \\ 3x + (-2 + \varepsilon_1)y = 3 + \varepsilon_4, \end{cases}$$

   where the unknown numbers ε_j satisfy the conditions $|\varepsilon_j| < 0.05$ for all $j = 1, \ldots, 4$.

4. Find the approximate inverse matrix to the matrix A and evaluate the approximation error with respect to the uniform norm $\|\cdot\|_1$ if the elements of the matrix A are known with an absolute error of 0.01:

$$A \approx \begin{pmatrix} 4 & -1 \\ 9 & -8 \end{pmatrix}$$

5. Use simple iteration method for finding the solution of the given linear system

$$\begin{cases} 23x + 6y + 3z = 2, \\ 4x + 24y + 5z = 4, \\ 9x + 2y + 25z = 4. \end{cases}$$

   Determine the iteration number after which the approximation error for each coordinate does not exceed 0.01 and find the corresponding approximate solution. Start with $x_0 = [0, 0, 0]^T$.

6. Find the most influential vertex in the graph using the PageRank algorithm with $\beta = 0.15$, where the graph adjacency matrix is defined as follows

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

7. Find the value $f(A)$ of the function $f(l) = e^{l+1}$, where

$$A = \begin{pmatrix} 10 & 13 & 7 \\ 4 & 7 & 3 \\ -12 & -15 & -7 \end{pmatrix}$$

Variant 63

1. Find the best approximation matrix A_1 of rank 2 of the matrix A in the norm $||\cdot||_2$ and find $||A - A_1||_2$, where

$$A = \begin{bmatrix} -16 & 46 & -132 & -108 \\ -158 & -13 & 42 & 36 \\ 40 & -118 & 24 & -90 \end{bmatrix}$$

2. Estimate the relative error of the approximate solution $(1, 1)$ of the system $AX = b$ in the norms $|\cdot|_1$ and $|\cdot|_2$ using the condition number of the matrix A, where

$$A = \begin{pmatrix} 0.94 & 0.19 \\ 3.02 & -6.86 \end{pmatrix}, b = \begin{pmatrix} 1.1 \\ -3.94 \end{pmatrix}$$

3. Solve the system approximately and estimate the error of the solution in the norms $|\cdot|_1, |\cdot|_2, |\cdot|_\infty$:

$$\begin{cases} (8 + \varepsilon_1)x + 2(-3 + \varepsilon_2)y = 3 + \varepsilon_3 \\ -4x + (-4 + \varepsilon_1)y = 4 + \varepsilon_4, \end{cases}$$

   where the unknown numbers ε_j satisfy the conditions $|\varepsilon_j| < 0.05$ for all $j = 1, \ldots, 4$.

4. Find the approximate inverse matrix to the matrix A and evaluate the approximation error with respect to the uniform norm $\|\cdot\|_1$ if the elements of the matrix A are known with an absolute error of 0.01:

$$A \approx \begin{pmatrix} 9 & -4 \\ 6 & 0 \end{pmatrix}$$

5. Use simple iteration method for finding the solution of the given linear system

$$\begin{cases} 20x + 3y + 3z = 9, \\ 6x + 19y + 5z = 2, \\ 4x + 4y + 20z = 2. \end{cases}$$

   Determine the iteration number after which the approximation error for each coordinate does not exceed 0.01 and find the corresponding approximate solution. Start with $x_0 = [0, 0, 0]^T$.

6. Find the most influential vertex in the graph using the PageRank algorithm with $\beta = 0.15$, where the graph adjacency matrix is defined as follows

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

7. Find the value $f(A)$ of the function $f(l) = e^{l+3}$, where

$$A = \begin{pmatrix} 6 & -2 & 3 \\ 13 & -5 & 7 \\ 11 & -6 & 6 \end{pmatrix}$$

Variant 64

1. Find the best approximation matrix A_1 of rank 2 of the matrix A in the norm $||\cdot||_2$ and find $||A - A_1||_2$, where

$$A = \begin{bmatrix} -51 & -64 & 86 & -80 \\ 42 & -68 & -101 & -4 \\ -30 & -8 & 58 & 98 \end{bmatrix}$$

2. Estimate the relative error of the approximate solution $(1, 1)$ of the system $AX = b$ in the norms $|\cdot|_1$ and $|\cdot|_2$ using the condition number of the matrix A, where

$$A = \begin{pmatrix} -3.05 & -0.18 \\ 3.02 & -4.01 \end{pmatrix}, b = \begin{pmatrix} -3.15 \\ -1.09 \end{pmatrix}$$

3. Solve the system approximately and estimate the error of the solution in the norms $|\cdot|_1, |\cdot|_2, |\cdot|_\infty$:

$$\begin{cases} -3(8 + \varepsilon_1)x + 3(1 + \varepsilon_2)y = 3 + \varepsilon_3 \\ -3x + (-3 + \varepsilon_1)y = 2 + \varepsilon_4, \end{cases}$$

   where the unknown numbers ε_j satisfy the conditions $|\varepsilon_j| < 0.05$ for all $j = 1, \ldots, 4$.

4. Find the approximate inverse matrix to the matrix A and evaluate the approximation error with respect to the uniform norm $\|\cdot\|_1$ if the elements of the matrix A are known with an absolute error of 0.01:

$$A \approx \begin{pmatrix} -7 & -1 \\ 4 & 3 \end{pmatrix}$$

5. Use simple iteration method for finding the solution of the given linear system

$$\begin{cases} 23x + 1y + 2z = 2, \\ 8x + 20y + 4z = 4, \\ 9x + 9y + 27z = 9. \end{cases}$$

   Determine the iteration number after which the approximation error for each coordinate does not exceed 0.01 and find the corresponding approximate solution. Start with $x_0 = [0, 0, 0]^T$.

6. Find the most influential vertex in the graph using the PageRank algorithm with $\beta = 0.15$, where the graph adjacency matrix is defined as follows

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

7. Find the value $f(A)$ of the function $f(l) = e^{l+3}$, where

$$A = \begin{pmatrix} -3 & -7 & -3 \\ 6 & 12 & 5 \\ -6 & -11 & -4 \end{pmatrix}$$

Variant 65

1. Find the best approximation matrix A_1 of rank 2 of the matrix A in the norm $||\cdot||_2$ and find $||A - A_1||_2$, where

$$A = \begin{bmatrix} -112 & -24 & 22 & -2 \\ -8 & -24 & -88 & 11 \\ 64 & -36 & 68 & 26 \end{bmatrix}$$

2. Estimate the relative error of the approximate solution $(1, 1)$ of the system $AX = b$ in the norms $|\cdot|_1$ and $|\cdot|_2$ using the condition number of the matrix A, where

$$A = \begin{pmatrix} -2.92 & -0.15 \\ 3.13 & -2.05 \end{pmatrix}, b = \begin{pmatrix} -3.12 \\ 0.91 \end{pmatrix}$$

3. Solve the system approximately and estimate the error of the solution in the norms $|\cdot|_1, |\cdot|_2, |\cdot|_\infty$:

$$\begin{cases} -3(8 + \varepsilon_1)x + 3(4 + \varepsilon_2)y = 4 + \varepsilon_3 \\ 3x + (4 + \varepsilon_1)y = -4 + \varepsilon_4, \end{cases}$$

   where the unknown numbers ε_j satisfy the conditions $|\varepsilon_j| < 0.05$ for all $j = 1, \ldots, 4$.

4. Find the approximate inverse matrix to the matrix A and evaluate the approximation error with respect to the uniform norm $\|\cdot\|_1$ if the elements of the matrix A are known with an absolute error of 0.01:

$$A \approx \begin{pmatrix} -2 & 2 \\ -3 & -6 \end{pmatrix}$$

5. Use simple iteration method for finding the solution of the given linear system

$$\begin{cases} 22x + 7y + 2z = 6, \\ 2x + 26y + 7z = 5, \\ 6x + 7y + 25z = 1. \end{cases}$$

   Determine the iteration number after which the approximation error for each coordinate does not exceed 0.01 and find the corresponding approximate solution. Start with $x_0 = [0, 0, 0]^T$.

6. Find the most influential vertex in the graph using the PageRank algorithm with $\beta = 0.15$, where the graph adjacency matrix is defined as follows

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

7. Find the value $f(A)$ of the function $f(l) = e^{l+1}$, where

$$A = \begin{pmatrix} 15 & 19 & -5 \\ -20 & -28 & 8 \\ -47 & -71 & 21 \end{pmatrix}$$

Variant 66

1. Find the best approximation matrix A_1 of rank 2 of the matrix A in the norm $||\cdot||_2$ and find $||A - A_1||_2$, where

$$A = \begin{bmatrix} -70 & -138 & 0 & -16 \\ 92 & -3 & -126 & 62 \\ -116 & 66 & -72 & -92 \end{bmatrix}$$

2. Estimate the relative error of the approximate solution $(1, 1)$ of the system $AX = b$ in the norms $|\cdot|_1$ and $|\cdot|_2$ using the condition number of the matrix A, where

$$A = \begin{pmatrix} 3.08 & 0.01 \\ 3.98 & -6.04 \end{pmatrix}, b = \begin{pmatrix} 3.0 \\ -1.99 \end{pmatrix}$$

3. Solve the system approximately and estimate the error of the solution in the norms $|\cdot|_1, |\cdot|_2, |\cdot|_\infty$:

$$\begin{cases} 3(-4 + \varepsilon_1)x + 3(-2 + \varepsilon_2)y = -2 + \varepsilon_3 \\ 1x + (2 + \varepsilon_1)y = 4 + \varepsilon_4, \end{cases}$$

   where the unknown numbers ε_j satisfy the conditions $|\varepsilon_j| < 0.05$ for all $j = 1, \ldots, 4$.

4. Find the approximate inverse matrix to the matrix A and evaluate the approximation error with respect to the uniform norm $\|\cdot\|_1$ if the elements of the matrix A are known with an absolute error of 0.01:

$$A \approx \begin{pmatrix} 6 & -4 \\ -2 & 7 \end{pmatrix}$$

5. Use simple iteration method for finding the solution of the given linear system

$$\begin{cases} 19x + 9y + 5z = 5, \\ 3x + 25y + 2z = 6, \\ 2x + 4y + 23z = 1. \end{cases}$$

   Determine the iteration number after which the approximation error for each coordinate does not exceed 0.01 and find the corresponding approximate solution. Start with $x_0 = [0, 0, 0]^T$.

6. Find the most influential vertex in the graph using the PageRank algorithm with $\beta = 0.15$, where the graph adjacency matrix is defined as follows

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

7. Find the value $f(A)$ of the function $f(l) = ln(l + 2)$, where

$$A = \begin{pmatrix} 17 & 7 & -3 \\ -29 & -11 & 5 \\ -14 & -6 & 4 \end{pmatrix}$$

Variant 67

1. Find the best approximation matrix A_1 of rank 2 of the matrix A in the norm $||\cdot||_2$ and find $||A - A_1||_2$, where

$$A = \begin{bmatrix} -28 & -53 & 60 & 4 \\ -32 & -10 & -72 & -46 \\ 8 & 58 & 12 & -44 \end{bmatrix}$$

2. Estimate the relative error of the approximate solution $(1, 1)$ of the system $AX = b$ in the norms $|\cdot|_1$ and $|\cdot|_2$ using the condition number of the matrix A, where

$$A = \begin{pmatrix} 4.9 & 0.17 \\ 1.87 & -0.93 \end{pmatrix}, b = \begin{pmatrix} 4.93 \\ 1.0 \end{pmatrix}$$

3. Solve the system approximately and estimate the error of the solution in the norms $|\cdot|_1, |\cdot|_2, |\cdot|_\infty$:

$$\begin{cases} 3(8 + \varepsilon_1)x + 2(1 + \varepsilon_2)y = 4 + \varepsilon_3 \\ 3x + (-1 + \varepsilon_1)y = -5 + \varepsilon_4, \end{cases}$$

   where the unknown numbers ε_j satisfy the conditions $|\varepsilon_j| < 0.05$ for all $j = 1, \ldots, 4$.

4. Find the approximate inverse matrix to the matrix A and evaluate the approximation error with respect to the uniform norm $\|\cdot\|_1$ if the elements of the matrix A are known with an absolute error of 0.01:

$$A \approx \begin{pmatrix} -6 & 3 \\ 0 & 1 \end{pmatrix}$$

5. Use simple iteration method for finding the solution of the given linear system

$$\begin{cases} 25x + 6y + 7z = 4, \\ 7x + 20y + 6z = 6, \\ 1x + 1y + 22z = 8. \end{cases}$$

   Determine the iteration number after which the approximation error for each coordinate does not exceed 0.01 and find the corresponding approximate solution. Start with $x_0 = [0, 0, 0]^T$.

6. Find the most influential vertex in the graph using the PageRank algorithm with $\beta = 0.15$, where the graph adjacency matrix is defined as follows

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

7. Find the value $f(A)$ of the function $f(l) = e^{l+2}$, where

$$A = \begin{pmatrix} 0 & 10 & 3 \\ -1 & 5 & 1 \\ 3 & -6 & 0 \end{pmatrix}$$

Variant 68

1. Find the best approximation matrix A_1 of rank 2 of the matrix A in the norm $||\cdot||_2$ and find $||A - A_1||_2$, where

$$A = \begin{bmatrix} 0 & 2 & -32 & -48 \\ 18 & -49 & 40 & 6 \\ -36 & -14 & -52 & 30 \end{bmatrix}$$

2. Estimate the relative error of the approximate solution $(1, 1)$ of the system $AX = b$ in the norms $|\cdot|_1$ and $|\cdot|_2$ using the condition number of the matrix A, where

$$A = \begin{pmatrix} -3.02 & -0.12 \\ 7.0 & -3.05 \end{pmatrix}, b = \begin{pmatrix} -2.91 \\ 4.09 \end{pmatrix}$$

3. Solve the system approximately and estimate the error of the solution in the norms $|\cdot|_1, |\cdot|_2, |\cdot|_\infty$:

$$\begin{cases} -3(4 + \varepsilon_1)x + 2(-3 + \varepsilon_2)y = -2 + \varepsilon_3 \\ -1x + (-2 + \varepsilon_1)y = -3 + \varepsilon_4, \end{cases}$$

   where the unknown numbers ε_j satisfy the conditions $|\varepsilon_j| < 0.05$ for all $j = 1, \ldots, 4$.

4. Find the approximate inverse matrix to the matrix A and evaluate the approximation error with respect to the uniform norm $\|\cdot\|_1$ if the elements of the matrix A are known with an absolute error of 0.01:

$$A \approx \begin{pmatrix} -5 & 8 \\ 0 & 3 \end{pmatrix}$$

5. Use simple iteration method for finding the solution of the given linear system

$$\begin{cases} 23x + 5y + 9z = 6, \\ 2x + 19y + 7z = 4, \\ 2x + 1y + 22z = 1. \end{cases}$$

   Determine the iteration number after which the approximation error for each coordinate does not exceed 0.01 and find the corresponding approximate solution. Start with $x_0 = [0, 0, 0]^T$.

6. Find the most influential vertex in the graph using the PageRank algorithm with $\beta = 0.15$, where the graph adjacency matrix is defined as follows

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

7. Find the value $f(A)$ of the function $f(l) = ln(l + 2)$, where

$$A = \begin{pmatrix} -7 & -9 & -10 \\ 10 & 13 & 14 \\ 1 & 0 & 0 \end{pmatrix}$$

Variant 69

1. Find the best approximation matrix A_1 of rank 2 of the matrix A in the norm $||\cdot||_2$ and find $||A - A_1||_2$, where

$$A = \begin{bmatrix} -116 & 0 & -28 & 84 \\ 100 & -36 & -52 & -6 \\ -4 & -36 & -2 & -156 \end{bmatrix}$$

2. Estimate the relative error of the approximate solution $(1, 1)$ of the system $AX = b$ in the norms $|\cdot|_1$ and $|\cdot|_2$ using the condition number of the matrix A, where

$$A = \begin{pmatrix} -0.91 & 0.09 \\ -3.85 & -0.96 \end{pmatrix}, b = \begin{pmatrix} -1.0 \\ -5.09 \end{pmatrix}$$

3. Solve the system approximately and estimate the error of the solution in the norms $|\cdot|_1, |\cdot|_2, |\cdot|_\infty$:

$$\begin{cases} -(-8 + \varepsilon_1)x + 3(4 + \varepsilon_2)y = -4 + \varepsilon_3 \\ -1x + (1 + \varepsilon_1)y = -3 + \varepsilon_4, \end{cases}$$

   where the unknown numbers ε_j satisfy the conditions $|\varepsilon_j| < 0.05$ for all $j = 1, \ldots, 4$.

4. Find the approximate inverse matrix to the matrix A and evaluate the approximation error with respect to the uniform norm $\|\cdot\|_1$ if the elements of the matrix A are known with an absolute error of 0.01:

$$A \approx \begin{pmatrix} -8 & -6 \\ 9 & -3 \end{pmatrix}$$

5. Use simple iteration method for finding the solution of the given linear system

$$\begin{cases} 19x + 3y + 8z = 5, \\ 2x + 20y + 6z = 2, \\ 4x + 2y + 22z = 8. \end{cases}$$

   Determine the iteration number after which the approximation error for each coordinate does not exceed 0.01 and find the corresponding approximate solution. Start with $x_0 = [0, 0, 0]^T$.

6. Find the most influential vertex in the graph using the PageRank algorithm with $\beta = 0.15$, where the graph adjacency matrix is defined as follows

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

7. Find the value $f(A)$ of the function $f(l) = e^{l+3}$, where

$$A = \begin{pmatrix} 3 & 10 & 11 \\ 1 & 14 & 13 \\ -1 & -10 & -9 \end{pmatrix}$$

Variant 70

1. Find the best approximation matrix A_1 of rank 2 of the matrix A in the norm $||\cdot||_2$ and find $||A - A_1||_2$, where

$$A = \begin{bmatrix} 48 & 38 & -22 & 40 \\ -12 & -52 & 2 & -8 \\ -72 & -8 & -23 & -28 \end{bmatrix}$$

2. Estimate the relative error of the approximate solution $(1, 1)$ of the system $AX = b$ in the norms $|\cdot|_1$ and $|\cdot|_2$ using the condition number of the matrix A, where

$$A = \begin{pmatrix} 0.97 & -0.16 \\ -4.19 & -6.06 \end{pmatrix}, b = \begin{pmatrix} 1.14 \\ -10.06 \end{pmatrix}$$

3. Solve the system approximately and estimate the error of the solution in the norms $|\cdot|_1, |\cdot|_2, |\cdot|_\infty$:

$$\begin{cases} (-8 + \varepsilon_1)x + 3(-2 + \varepsilon_2)y = 4 + \varepsilon_3 \\ -3x + (2 + \varepsilon_1)y = 4 + \varepsilon_4, \end{cases}$$

   where the unknown numbers ε_j satisfy the conditions $|\varepsilon_j| < 0.05$ for all $j = 1, \ldots, 4$.

4. Find the approximate inverse matrix to the matrix A and evaluate the approximation error with respect to the uniform norm $\|\cdot\|_1$ if the elements of the matrix A are known with an absolute error of 0.01:

$$A \approx \begin{pmatrix} 7 & 3 \\ 0 & -7 \end{pmatrix}$$

5. Use simple iteration method for finding the solution of the given linear system

$$\begin{cases} 23x + 6y + 8z = 7, \\ 8x + 25y + 5z = 2, \\ 4x + 1y + 26z = 3. \end{cases}$$

   Determine the iteration number after which the approximation error for each coordinate does not exceed 0.01 and find the corresponding approximate solution. Start with $x_0 = [0, 0, 0]^T$.

6. Find the most influential vertex in the graph using the PageRank algorithm with $\beta = 0.15$, where the graph adjacency matrix is defined as follows

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

7. Find the value $f(A)$ of the function $f(l) = ln(l + 2)$, where

$$A = \begin{pmatrix} -2 & -2 & -3 \\ -6 & -2 & -5 \\ 12 & 8 & 12 \end{pmatrix}$$

Variant 71

1. Find the best approximation matrix A_1 of rank 2 of the matrix A in the norm $||\cdot||_2$ and find $||A - A_1||_2$, where

$$A = \begin{bmatrix} 4 & 40 & -90 & 83 \\ -28 & -136 & 27 & 22 \\ 64 & -26 & -18 & -94 \end{bmatrix}$$

2. Estimate the relative error of the approximate solution $(1, 1)$ of the system $AX = b$ in the norms $|\cdot|_1$ and $|\cdot|_2$ using the condition number of the matrix A, where

$$A = \begin{pmatrix} 0.92 & 0.12 \\ -4.88 & -7.18 \end{pmatrix}, b = \begin{pmatrix} 1.06 \\ -12.09 \end{pmatrix}$$

3. Solve the system approximately and estimate the error of the solution in the norms $|\cdot|_1, |\cdot|_2, |\cdot|_\infty$:

$$\begin{cases} (-10 + \varepsilon_1)x + 2(-3 + \varepsilon_2)y = -4 + \varepsilon_3 \\ -3x + (4 + \varepsilon_1)y = 1 + \varepsilon_4, \end{cases}$$

   where the unknown numbers ε_j satisfy the conditions $|\varepsilon_j| < 0.05$ for all $j = 1, \ldots, 4$.

4. Find the approximate inverse matrix to the matrix A and evaluate the approximation error with respect to the uniform norm $\|\cdot\|_1$ if the elements of the matrix A are known with an absolute error of 0.01:

$$A \approx \begin{pmatrix} -9 & -2 \\ 2 & -3 \end{pmatrix}$$

5. Use simple iteration method for finding the solution of the given linear system

$$\begin{cases} 26x + 9y + 8z = 9, \\ 6x + 26y + 3z = 1, \\ 1x + 1y + 21z = 7. \end{cases}$$

   Determine the iteration number after which the approximation error for each coordinate does not exceed 0.01 and find the corresponding approximate solution. Start with $x_0 = [0, 0, 0]^T$.

6. Find the most influential vertex in the graph using the PageRank algorithm with $\beta = 0.15$, where the graph adjacency matrix is defined as follows

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

7. Find the value $f(A)$ of the function $f(l) = ln(l + 6)$, where

$$A = \begin{pmatrix} -1 & -1 & 0 \\ 4 & -1 & 4 \\ 4 & -4 & 7 \end{pmatrix}$$

Variant 72

1. Find the best approximation matrix A_1 of rank 2 of the matrix A in the norm $||\cdot||_2$ and find $||A - A_1||_2$, where

$$A = \begin{bmatrix} -14 & -18 & 11 & 14 \\ 16 & 6 & 2 & -28 \\ -22 & 15 & -26 & 10 \end{bmatrix}$$

2. Estimate the relative error of the approximate solution $(1, 1)$ of the system $AX = b$ in the norms $|\cdot|_1$ and $|\cdot|_2$ using the condition number of the matrix A, where

$$A = \begin{pmatrix} -4.94 & -0.0 \\ 1.96 & -2.96 \end{pmatrix}, b = \begin{pmatrix} -5.04 \\ -1.06 \end{pmatrix}$$

3. Solve the system approximately and estimate the error of the solution in the norms $|\cdot|_1, |\cdot|_2, |\cdot|_\infty$:

$$\begin{cases} -5(6 + \varepsilon_1)x + 4(4 + \varepsilon_2)y = -2 + \varepsilon_3 \\ -2x + (4 + \varepsilon_1)y = -5 + \varepsilon_4, \end{cases}$$

   where the unknown numbers ε_j satisfy the conditions $|\varepsilon_j| < 0.05$ for all $j = 1, \ldots, 4$.

4. Find the approximate inverse matrix to the matrix A and evaluate the approximation error with respect to the uniform norm $\|\cdot\|_1$ if the elements of the matrix A are known with an absolute error of 0.01:

$$A \approx \begin{pmatrix} -7 & 4 \\ -7 & -3 \end{pmatrix}$$

5. Use simple iteration method for finding the solution of the given linear system

$$\begin{cases} 20x + 2y + 7z = 1, \\ 9x + 27y + 1z = 8, \\ 5x + 1y + 27z = 2. \end{cases}$$

   Determine the iteration number after which the approximation error for each coordinate does not exceed 0.01 and find the corresponding approximate solution. Start with $x_0 = [0, 0, 0]^T$.

6. Find the most influential vertex in the graph using the PageRank algorithm with $\beta = 0.15$, where the graph adjacency matrix is defined as follows

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

7. Find the value $f(A)$ of the function $f(l) = ln(l + 2)$, where

$$A = \begin{pmatrix} 2 & 1 & -2 \\ 1 & 26 & -26 \\ 1 & 21 & -21 \end{pmatrix}$$

Variant 73

1. Find the best approximation matrix A_1 of rank 2 of the matrix A in the norm $||\cdot||_2$ and find $||A - A_1||_2$, where

$$A = \begin{bmatrix} 70 & -56 & -6 & 26 \\ -44 & 4 & 18 & -37 \\ -88 & 32 & -15 & 22 \end{bmatrix}$$

2. Estimate the relative error of the approximate solution $(1, 1)$ of the system $AX = b$ in the norms $|\cdot|_1$ and $|\cdot|_2$ using the condition number of the matrix A, where

$$A = \begin{pmatrix} -3.04 & -0.2 \\ 8.15 & -4.94 \end{pmatrix}, b = \begin{pmatrix} -2.98 \\ 3.09 \end{pmatrix}$$

3. Solve the system approximately and estimate the error of the solution in the norms $|\cdot|_1, |\cdot|_2, |\cdot|_\infty$:

$$\begin{cases} -3(-2 + \varepsilon_1)x + 4(2 + \varepsilon_2)y = -4 + \varepsilon_3 \\ -4x + (-4 + \varepsilon_1)y = 1 + \varepsilon_4, \end{cases}$$

   where the unknown numbers ε_j satisfy the conditions $|\varepsilon_j| < 0.05$ for all $j = 1, \ldots, 4$.

4. Find the approximate inverse matrix to the matrix A and evaluate the approximation error with respect to the uniform norm $\|\cdot\|_1$ if the elements of the matrix A are known with an absolute error of 0.01:

$$A \approx \begin{pmatrix} 2 & 8 \\ 5 & 1 \end{pmatrix}$$

5. Use simple iteration method for finding the solution of the given linear system

$$\begin{cases} 19x + 2y + 2z = 7, \\ 6x + 27y + 7z = 9, \\ 2x + 9y + 23z = 1. \end{cases}$$

   Determine the iteration number after which the approximation error for each coordinate does not exceed 0.01 and find the corresponding approximate solution. Start with $x_0 = [0, 0, 0]^T$.

6. Find the most influential vertex in the graph using the PageRank algorithm with $\beta = 0.15$, where the graph adjacency matrix is defined as follows

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

7. Find the value $f(A)$ of the function $f(l) = e^{l+3}$, where

$$A = \begin{pmatrix} 4 & -5 & 3 \\ 0 & 1 & 1 \\ 0 & -1 & 3 \end{pmatrix}$$

Variant 74

1. Find the best approximation matrix A_1 of rank 2 of the matrix A in the norm $||\cdot||_2$ and find $||A - A_1||_2$, where

$$A = \begin{bmatrix} 26 & -64 & -32 & 60 \\ -44 & -56 & -88 & -66 \\ -4 & 20 & 112 & -36 \end{bmatrix}$$

2. Estimate the relative error of the approximate solution $(1, 1)$ of the system $AX = b$ in the norms $|\cdot|_1$ and $|\cdot|_2$ using the condition number of the matrix A, where

$$A = \begin{pmatrix} -3.94 & -0.05 \\ 6.87 & -3.18 \end{pmatrix}, b = \begin{pmatrix} -3.91 \\ 3.93 \end{pmatrix}$$

3. Solve the system approximately and estimate the error of the solution in the norms $|\cdot|_1, |\cdot|_2, |\cdot|_\infty$:

$$\begin{cases} -4(4 + \varepsilon_1)x + 4(-1 + \varepsilon_2)y = 2 + \varepsilon_3 \\ -3x + (3 + \varepsilon_1)y = -4 + \varepsilon_4, \end{cases}$$

   where the unknown numbers ε_j satisfy the conditions $|\varepsilon_j| < 0.05$ for all $j = 1, \ldots, 4$.

4. Find the approximate inverse matrix to the matrix A and evaluate the approximation error with respect to the uniform norm $\|\cdot\|_1$ if the elements of the matrix A are known with an absolute error of 0.01:

$$A \approx \begin{pmatrix} -9 & 6 \\ -2 & 4 \end{pmatrix}$$

5. Use simple iteration method for finding the solution of the given linear system

$$\begin{cases} 20x + 1y + 5z = 5, \\ 3x + 22y + 7z = 8, \\ 3x + 7y + 21z = 5. \end{cases}$$

   Determine the iteration number after which the approximation error for each coordinate does not exceed 0.01 and find the corresponding approximate solution. Start with $x_0 = [0, 0, 0]^T$.

6. Find the most influential vertex in the graph using the PageRank algorithm with $\beta = 0.15$, where the graph adjacency matrix is defined as follows

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

7. Find the value $f(A)$ of the function $f(l) = e^{l+2}$, where

$$A = \begin{pmatrix} 2 & 21 & -22 \\ 1 & 32 & -32 \\ 1 & 26 & -26 \end{pmatrix}$$

Variant 75

1. Find the best approximation matrix A_1 of rank 2 of the matrix A in the norm $||\cdot||_2$ and find $||A - A_1||_2$, where

$$A = \begin{bmatrix} -24 & 64 & 42 & 40 \\ 12 & -20 & -66 & -14 \\ -30 & -88 & 21 & -34 \end{bmatrix}$$

2. Estimate the relative error of the approximate solution $(1, 1)$ of the system $AX = b$ in the norms $|\cdot|_1$ and $|\cdot|_2$ using the condition number of the matrix A, where

$$A = \begin{pmatrix} -5.01 & 0.2 \\ 1.82 & -7.99 \end{pmatrix}, b = \begin{pmatrix} -4.92 \\ -5.98 \end{pmatrix}$$

3. Solve the system approximately and estimate the error of the solution in the norms $|\cdot|_1, |\cdot|_2, |\cdot|_\infty$:

$$\begin{cases} -5(6 + \varepsilon_1)x + 3(-4 + \varepsilon_2)y = -4 + \varepsilon_3 \\ 1x + (4 + \varepsilon_1)y = -5 + \varepsilon_4, \end{cases}$$

   where the unknown numbers ε_j satisfy the conditions $|\varepsilon_j| < 0.05$ for all $j = 1, \ldots, 4$.

4. Find the approximate inverse matrix to the matrix A and evaluate the approximation error with respect to the uniform norm $\|\cdot\|_1$ if the elements of the matrix A are known with an absolute error of 0.01:

$$A \approx \begin{pmatrix} 9 & -4 \\ 2 & 6 \end{pmatrix}$$

5. Use simple iteration method for finding the solution of the given linear system

$$\begin{cases} 26x + 4y + 5z = 1, \\ 7x + 22y + 2z = 2, \\ 2x + 8y + 21z = 9. \end{cases}$$

   Determine the iteration number after which the approximation error for each coordinate does not exceed 0.01 and find the corresponding approximate solution. Start with $x_0 = [0, 0, 0]^T$.

6. Find the most influential vertex in the graph using the PageRank algorithm with $\beta = 0.15$, where the graph adjacency matrix is defined as follows

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

7. Find the value $f(A)$ of the function $f(l) = e^{l+1}$, where

$$A = \begin{pmatrix} 6 & 9 & -4 \\ 0 & 2 & -1 \\ 0 & 1 & 0 \end{pmatrix}$$

Variant 76

1. Find the best approximation matrix A_1 of rank 2 of the matrix A in the norm $||\cdot||_2$ and find $||A - A_1||_2$, where

$$A = \begin{bmatrix} 2 & 19 & 20 & -30 \\ -28 & -2 & -16 & 18 \\ 16 & -34 & -26 & -12 \end{bmatrix}$$

2. Estimate the relative error of the approximate solution $(1, 1)$ of the system $AX = b$ in the norms $|\cdot|_1$ and $|\cdot|_2$ using the condition number of the matrix A, where

$$A = \begin{pmatrix} -3.03 & -0.19 \\ 6.05 & -3.86 \end{pmatrix}, b = \begin{pmatrix} -3.1 \\ 2.03 \end{pmatrix}$$

3. Solve the system approximately and estimate the error of the solution in the norms $|\cdot|_1, |\cdot|_2, |\cdot|_\infty$:

$$\begin{cases} -3(2 + \varepsilon_1)x + 4(3 + \varepsilon_2)y = -3 + \varepsilon_3 \\ 1x + (-3 + \varepsilon_1)y = 3 + \varepsilon_4, \end{cases}$$

   where the unknown numbers ε_j satisfy the conditions $|\varepsilon_j| < 0.05$ for all $j = 1, \ldots, 4$.

4. Find the approximate inverse matrix to the matrix A and evaluate the approximation error with respect to the uniform norm $\|\cdot\|_1$ if the elements of the matrix A are known with an absolute error of 0.01:

$$A \approx \begin{pmatrix} -3 & 7 \\ 8 & 5 \end{pmatrix}$$

5. Use simple iteration method for finding the solution of the given linear system

$$\begin{cases} 20x + 2y + 4z = 5, \\ 8x + 27y + 8z = 8, \\ 1x + 2y + 26z = 3. \end{cases}$$

   Determine the iteration number after which the approximation error for each coordinate does not exceed 0.01 and find the corresponding approximate solution. Start with $x_0 = [0, 0, 0]^T$.

6. Find the most influential vertex in the graph using the PageRank algorithm with $\beta = 0.15$, where the graph adjacency matrix is defined as follows

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

7. Find the value $f(A)$ of the function $f(l) = ln(l + 3)$, where

$$A = \begin{pmatrix} -8 & 5 & 6 \\ -37 & 21 & 23 \\ 9 & -5 & -5 \end{pmatrix}$$

Variant 77

1. Find the best approximation matrix A_1 of rank 2 of the matrix A in the norm $||\cdot||_2$ and find $||A - A_1||_2$, where

$$A = \begin{bmatrix} 14 & -82 & -36 & -4 \\ -2 & 25 & -54 & 40 \\ -32 & -2 & 72 & 16 \end{bmatrix}$$

2. Estimate the relative error of the approximate solution $(1, 1)$ of the system $AX = b$ in the norms $|\cdot|_1$ and $|\cdot|_2$ using the condition number of the matrix A, where

$$A = \begin{pmatrix} 2.03 & -0.11 \\ -5.06 & -7.85 \end{pmatrix}, b = \begin{pmatrix} 1.89 \\ -13.02 \end{pmatrix}$$

3. Solve the system approximately and estimate the error of the solution in the norms $|\cdot|_1, |\cdot|_2, |\cdot|_\infty$:

$$\begin{cases} 2(-10 + \varepsilon_1)x + 3(4 + \varepsilon_2)y = -1 + \varepsilon_3 \\ 3x + (1 + \varepsilon_1)y = 2 + \varepsilon_4, \end{cases}$$

   where the unknown numbers ε_j satisfy the conditions $|\varepsilon_j| < 0.05$ for all $j = 1, \ldots, 4$.

4. Find the approximate inverse matrix to the matrix A and evaluate the approximation error with respect to the uniform norm $\|\cdot\|_1$ if the elements of the matrix A are known with an absolute error of 0.01:

$$A \approx \begin{pmatrix} -2 & -7 \\ 8 & -7 \end{pmatrix}$$

5. Use simple iteration method for finding the solution of the given linear system

$$\begin{cases} 19x + 6y + 1z = 1, \\ 3x + 21y + 3z = 4, \\ 8x + 7y + 23z = 8. \end{cases}$$

   Determine the iteration number after which the approximation error for each coordinate does not exceed 0.01 and find the corresponding approximate solution. Start with $x_0 = [0, 0, 0]^T$.

6. Find the most influential vertex in the graph using the PageRank algorithm with $\beta = 0.15$, where the graph adjacency matrix is defined as follows

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

7. Find the value $f(A)$ of the function $f(l) = ln(l + 7)$, where

$$A = \begin{pmatrix} 27 & 21 & 4 \\ -43 & -34 & -7 \\ 83 & 69 & 16 \end{pmatrix}$$

Variant 78

1. Find the best approximation matrix A_1 of rank 2 of the matrix A in the norm $||\cdot||_2$ and find $||A - A_1||_2$, where

$$A = \begin{bmatrix} 52 & -88 & -80 & 9 \\ 20 & 76 & 32 & -78 \\ -64 & -50 & 8 & 42 \end{bmatrix}$$

2. Estimate the relative error of the approximate solution $(1, 1)$ of the system $AX = b$ in the norms $|\cdot|_1$ and $|\cdot|_2$ using the condition number of the matrix A, where

$$A = \begin{pmatrix} 2.92 & -0.02 \\ -2.9 & -8.18 \end{pmatrix}, b = \begin{pmatrix} 3.0 \\ -11.09 \end{pmatrix}$$

3. Solve the system approximately and estimate the error of the solution in the norms $|\cdot|_1, |\cdot|_2, |\cdot|_\infty$:

$$\begin{cases} 3(-6 + \varepsilon_1)x + 3(2 + \varepsilon_2)y = 4 + \varepsilon_3 \\ -3x + (2 + \varepsilon_1)y = 2 + \varepsilon_4, \end{cases}$$

   where the unknown numbers ε_j satisfy the conditions $|\varepsilon_j| < 0.05$ for all $j = 1, \ldots, 4$.

4. Find the approximate inverse matrix to the matrix A and evaluate the approximation error with respect to the uniform norm $\|\cdot\|_1$ if the elements of the matrix A are known with an absolute error of 0.01:

$$A \approx \begin{pmatrix} -6 & -3 \\ 0 & -8 \end{pmatrix}$$

5. Use simple iteration method for finding the solution of the given linear system

$$\begin{cases} 22x + 3y + 7z = 5, \\ 3x + 26y + 2z = 6, \\ 1x + 6y + 19z = 1. \end{cases}$$

   Determine the iteration number after which the approximation error for each coordinate does not exceed 0.01 and find the corresponding approximate solution. Start with $x_0 = [0, 0, 0]^T$.

6. Find the most influential vertex in the graph using the PageRank algorithm with $\beta = 0.15$, where the graph adjacency matrix is defined as follows

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

7. Find the value $f(A)$ of the function $f(l) = e^{l+2}$, where

$$A = \begin{pmatrix} -20 & -15 & -7 \\ 28 & 21 & 9 \\ 16 & 11 & 7 \end{pmatrix}$$

Variant 79

1. Find the best approximation matrix A_1 of rank 2 of the matrix A in the norm $||\cdot||_2$ and find $||A - A_1||_2$, where

$$A = \begin{bmatrix} -4 & 7 & 6 & -32 \\ -14 & -4 & -36 & -7 \\ -16 & 22 & 12 & 22 \end{bmatrix}$$

2. Estimate the relative error of the approximate solution $(1, 1)$ of the system $AX = b$ in the norms $|\cdot|_1$ and $|\cdot|_2$ using the condition number of the matrix A, where

$$A = \begin{pmatrix} -1.99 & -0.01 \\ 8.16 & -3.13 \end{pmatrix}, b = \begin{pmatrix} -1.96 \\ 5.07 \end{pmatrix}$$

3. Solve the system approximately and estimate the error of the solution in the norms $|\cdot|_1, |\cdot|_2, |\cdot|_\infty$:

$$\begin{cases} -2(4 + \varepsilon_1)x + 3(-4 + \varepsilon_2)y = -1 + \varepsilon_3 \\ -2x + (3 + \varepsilon_1)y = -1 + \varepsilon_4, \end{cases}$$

   where the unknown numbers ε_j satisfy the conditions $|\varepsilon_j| < 0.05$ for all $j = 1, \ldots, 4$.

4. Find the approximate inverse matrix to the matrix A and evaluate the approximation error with respect to the uniform norm $\|\cdot\|_1$ if the elements of the matrix A are known with an absolute error of 0.01:

$$A \approx \begin{pmatrix} -4 & 1 \\ 3 & 9 \end{pmatrix}$$

5. Use simple iteration method for finding the solution of the given linear system

$$\begin{cases} 19x + 3y + 6z = 2, \\ 3x + 19y + 4z = 7, \\ 6x + 4y + 24z = 1. \end{cases}$$

   Determine the iteration number after which the approximation error for each coordinate does not exceed 0.01 and find the corresponding approximate solution. Start with $x_0 = [0, 0, 0]^T$.

6. Find the most influential vertex in the graph using the PageRank algorithm with $\beta = 0.15$, where the graph adjacency matrix is defined as follows

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

7. Find the value $f(A)$ of the function $f(l) = ln(l + 3)$, where

$$A = \begin{pmatrix} -4 & 11 & -5 \\ -9 & 19 & -8 \\ -9 & 17 & -6 \end{pmatrix}$$

Variant 80

1. Find the best approximation matrix A_1 of rank 2 of the matrix A in the norm $||\cdot||_2$ and find $||A - A_1||_2$, where

$$A = \begin{bmatrix} 10 & 4 & 9 & -8 \\ -14 & -8 & 6 & 10 \\ 8 & -10 & -12 & -13 \end{bmatrix}$$

2. Estimate the relative error of the approximate solution $(1, 1)$ of the system $AX = b$ in the norms $|\cdot|_1$ and $|\cdot|_2$ using the condition number of the matrix A, where

$$A = \begin{pmatrix} 1.06 & 0.12 \\ 5.15 & -7.09 \end{pmatrix}, b = \begin{pmatrix} 0.86 \\ -2.06 \end{pmatrix}$$

3. Solve the system approximately and estimate the error of the solution in the norms $|\cdot|_1, |\cdot|_2, |\cdot|_\infty$:

$$\begin{cases} (-6 + \varepsilon_1)x + 2(-5 + \varepsilon_2)y = -2 + \varepsilon_3 \\ 3x + (-3 + \varepsilon_1)y = -1 + \varepsilon_4, \end{cases}$$

   where the unknown numbers ε_j satisfy the conditions $|\varepsilon_j| < 0.05$ for all $j = 1, \ldots, 4$.

4. Find the approximate inverse matrix to the matrix A and evaluate the approximation error with respect to the uniform norm $\|\cdot\|_1$ if the elements of the matrix A are known with an absolute error of 0.01:

$$A \approx \begin{pmatrix} -9 & 4 \\ 0 & 4 \end{pmatrix}$$

5. Use simple iteration method for finding the solution of the given linear system

$$\begin{cases} 19x + 5y + 1z = 6, \\ 9x + 27y + 4z = 4, \\ 6x + 5y + 21z = 2. \end{cases}$$

   Determine the iteration number after which the approximation error for each coordinate does not exceed 0.01 and find the corresponding approximate solution. Start with $x_0 = [0, 0, 0]^T$.

6. Find the most influential vertex in the graph using the PageRank algorithm with $\beta = 0.15$, where the graph adjacency matrix is defined as follows

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

7. Find the value $f(A)$ of the function $f(l) = e^{l+1}$, where

$$A = \begin{pmatrix} -14 & 13 & 14 \\ 9 & -6 & -8 \\ -27 & 23 & 26 \end{pmatrix}$$

Variant 81

1. Find the best approximation matrix A_1 of rank 2 of the matrix A in the norm $||\cdot||_2$ and find $||A - A_1||_2$, where

$$A = \begin{bmatrix} -6 & 44 & -57 & -64 \\ -96 & -10 & 60 & 47 \\ 42 & -32 & -114 & 34 \end{bmatrix}$$

2. Estimate the relative error of the approximate solution $(1, 1)$ of the system $AX = b$ in the norms $|\cdot|_1$ and $|\cdot|_2$ using the condition number of the matrix A, where

$$A = \begin{pmatrix} -5.01 & -0.08 \\ 8.0 & -6.17 \end{pmatrix}, b = \begin{pmatrix} -5.12 \\ 2.08 \end{pmatrix}$$

3. Solve the system approximately and estimate the error of the solution in the norms $|\cdot|_1, |\cdot|_2, |\cdot|_\infty$:

$$\begin{cases} -5(-4 + \varepsilon_1)x + 4(-5 + \varepsilon_2)y = 4 + \varepsilon_3 \\ 4x + (2 + \varepsilon_1)y = -3 + \varepsilon_4, \end{cases}$$

   where the unknown numbers ε_j satisfy the conditions $|\varepsilon_j| < 0.05$ for all $j = 1, \ldots, 4$.

4. Find the approximate inverse matrix to the matrix A and evaluate the approximation error with respect to the uniform norm $\|\cdot\|_1$ if the elements of the matrix A are known with an absolute error of 0.01:

$$A \approx \begin{pmatrix} 8 & 2 \\ 2 & 4 \end{pmatrix}$$

5. Use simple iteration method for finding the solution of the given linear system

$$\begin{cases} 21x + 6y + 5z = 4, \\ 4x + 23y + 8z = 7, \\ 3x + 1y + 20z = 6. \end{cases}$$

   Determine the iteration number after which the approximation error for each coordinate does not exceed 0.01 and find the corresponding approximate solution. Start with $x_0 = [0, 0, 0]^T$.

6. Find the most influential vertex in the graph using the PageRank algorithm with $\beta = 0.15$, where the graph adjacency matrix is defined as follows

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

7. Find the value $f(A)$ of the function $f(l) = e^{l+3}$, where

$$A = \begin{pmatrix} -7 & 5 & -2 \\ -21 & 13 & -5 \\ 6 & -4 & 3 \end{pmatrix}$$

Variant 82

1. Find the best approximation matrix A_1 of rank 2 of the matrix A in the norm $||\cdot||_2$ and find $||A - A_1||_2$, where

$$A = \begin{bmatrix} -78 & -108 & 17 & 38 \\ 60 & 72 & -2 & -98 \\ -48 & -18 & -38 & 52 \end{bmatrix}$$

2. Estimate the relative error of the approximate solution $(1, 1)$ of the system $AX = b$ in the norms $|\cdot|_1$ and $|\cdot|_2$ using the condition number of the matrix A, where

$$A = \begin{pmatrix} -4.06 & 0.14 \\ 6.01 & -6.91 \end{pmatrix}, b = \begin{pmatrix} -4.09 \\ -1.05 \end{pmatrix}$$

3. Solve the system approximately and estimate the error of the solution in the norms $|\cdot|_1, |\cdot|_2, |\cdot|_\infty$:

$$\begin{cases} -4(-6 + \varepsilon_1)x + 2(-2 + \varepsilon_2)y = 3 + \varepsilon_3 \\ 1x + (-1 + \varepsilon_1)y = -3 + \varepsilon_4, \end{cases}$$

   where the unknown numbers ε_j satisfy the conditions $|\varepsilon_j| < 0.05$ for all $j = 1, \ldots, 4$.

4. Find the approximate inverse matrix to the matrix A and evaluate the approximation error with respect to the uniform norm $\|\cdot\|_1$ if the elements of the matrix A are known with an absolute error of 0.01:

$$A \approx \begin{pmatrix} -2 & -6 \\ 0 & 4 \end{pmatrix}$$

5. Use simple iteration method for finding the solution of the given linear system

$$\begin{cases} 26x + 7y + 5z = 3, \\ 4x + 27y + 9z = 6, \\ 8x + 1y + 25z = 7. \end{cases}$$

   Determine the iteration number after which the approximation error for each coordinate does not exceed 0.01 and find the corresponding approximate solution. Start with $x_0 = [0, 0, 0]^T$.

6. Find the most influential vertex in the graph using the PageRank algorithm with $\beta = 0.15$, where the graph adjacency matrix is defined as follows

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

7. Find the value $f(A)$ of the function $f(l) = e^{l+1}$, where

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

Variant 83

1. Find the best approximation matrix A_1 of rank 2 of the matrix A in the norm $||\cdot||_2$ and find $||A - A_1||_2$, where

$$A = \begin{bmatrix} 27 & 88 & -20 & 62 \\ -90 & -64 & -28 & -41 \\ 18 & -74 & 16 & -10 \end{bmatrix}$$

2. Estimate the relative error of the approximate solution $(1, 1)$ of the system $AX = b$ in the norms $|\cdot|_1$ and $|\cdot|_2$ using the condition number of the matrix A, where

$$A = \begin{pmatrix} 2.94 & -0.01 \\ -0.89 & -6.11 \end{pmatrix}, b = \begin{pmatrix} 2.88 \\ -7.0 \end{pmatrix}$$

3. Solve the system approximately and estimate the error of the solution in the norms $|\cdot|_1, |\cdot|_2, |\cdot|_\infty$:

$$\begin{cases} 3(-2 + \varepsilon_1)x + 3(-2 + \varepsilon_2)y = -3 + \varepsilon_3 \\ -2x + (-3 + \varepsilon_1)y = -4 + \varepsilon_4, \end{cases}$$

   where the unknown numbers ε_j satisfy the conditions $|\varepsilon_j| < 0.05$ for all $j = 1, \ldots, 4$.

4. Find the approximate inverse matrix to the matrix A and evaluate the approximation error with respect to the uniform norm $\|\cdot\|_1$ if the elements of the matrix A are known with an absolute error of 0.01:

$$A \approx \begin{pmatrix} 0 & 1 \\ -9 & -8 \end{pmatrix}$$

5. Use simple iteration method for finding the solution of the given linear system

$$\begin{cases} 21x + 4y + 5z = 2, \\ 8x + 27y + 6z = 6, \\ 6x + 2y + 20z = 1. \end{cases}$$

   Determine the iteration number after which the approximation error for each coordinate does not exceed 0.01 and find the corresponding approximate solution. Start with $x_0 = [0, 0, 0]^T$.

6. Find the most influential vertex in the graph using the PageRank algorithm with $\beta = 0.15$, where the graph adjacency matrix is defined as follows

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

7. Find the value $f(A)$ of the function $f(l) = ln(l + 6)$, where

$$A = \begin{pmatrix} 11 & 21 & 11 \\ -5 & -10 & -6 \\ 5 & 11 & 7 \end{pmatrix}$$

Variant 84

1. Find the best approximation matrix A_1 of rank 2 of the matrix A in the norm $||\cdot||_2$ and find $||A - A_1||_2$, where

$$A = \begin{bmatrix} 41 & -2 & -66 & -118 \\ -62 & 74 & -42 & 13 \\ 10 & -100 & 48 & 46 \end{bmatrix}$$

2. Estimate the relative error of the approximate solution $(1, 1)$ of the system $AX = b$ in the norms $|\cdot|_1$ and $|\cdot|_2$ using the condition number of the matrix A, where

$$A = \begin{pmatrix} 4.03 & 0.1 \\ 1.97 & -3.88 \end{pmatrix}, b = \begin{pmatrix} 4.17 \\ -1.99 \end{pmatrix}$$

3. Solve the system approximately and estimate the error of the solution in the norms $|\cdot|_1, |\cdot|_2, |\cdot|_\infty$:

$$\begin{cases} 4(6 + \varepsilon_1)x + 3(1 + \varepsilon_2)y = 4 + \varepsilon_3 \\ -5x + (-4 + \varepsilon_1)y = 1 + \varepsilon_4, \end{cases}$$

   where the unknown numbers ε_j satisfy the conditions $|\varepsilon_j| < 0.05$ for all $j = 1, \ldots, 4$.

4. Find the approximate inverse matrix to the matrix A and evaluate the approximation error with respect to the uniform norm $\|\cdot\|_1$ if the elements of the matrix A are known with an absolute error of 0.01:

$$A \approx \begin{pmatrix} -3 & -5 \\ -5 & -9 \end{pmatrix}$$

5. Use simple iteration method for finding the solution of the given linear system

$$\begin{cases} 27x + 2y + 2z = 5, \\ 9x + 24y + 8z = 6, \\ 3x + 1y + 26z = 7. \end{cases}$$

   Determine the iteration number after which the approximation error for each coordinate does not exceed 0.01 and find the corresponding approximate solution. Start with $x_0 = [0, 0, 0]^T$.

6. Find the most influential vertex in the graph using the PageRank algorithm with $\beta = 0.15$, where the graph adjacency matrix is defined as follows

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

7. Find the value $f(A)$ of the function $f(l) = ln(l + 2)$, where

$$A = \begin{pmatrix} 2 & 8 & -7 \\ -1 & -13 & 13 \\ -1 & -16 & 16 \end{pmatrix}$$

Variant 85

1. Find the best approximation matrix A_1 of rank 2 of the matrix A in the norm $||\cdot||_2$ and find $||A - A_1||_2$, where

$$A = \begin{bmatrix} -24 & -6 & 90 & 22 \\ -30 & -21 & 72 & -124 \\ 12 & -24 & -126 & 49 \end{bmatrix}$$

2. Estimate the relative error of the approximate solution $(1, 1)$ of the system $AX = b$ in the norms $|\cdot|_1$ and $|\cdot|_2$ using the condition number of the matrix A, where

$$A = \begin{pmatrix} 2.03 & 0.07 \\ 7.06 & -4.93 \end{pmatrix}, b = \begin{pmatrix} 2.17 \\ 2.1 \end{pmatrix}$$

3. Solve the system approximately and estimate the error of the solution in the norms $|\cdot|_1, |\cdot|_2, |\cdot|_\infty$:

$$\begin{cases} 2(-2 + \varepsilon_1)x + 2(-5 + \varepsilon_2)y = 1 + \varepsilon_3 \\ -3x + (4 + \varepsilon_1)y = -3 + \varepsilon_4, \end{cases}$$

   where the unknown numbers ε_j satisfy the conditions $|\varepsilon_j| < 0.05$ for all $j = 1, \ldots, 4$.

4. Find the approximate inverse matrix to the matrix A and evaluate the approximation error with respect to the uniform norm $\|\cdot\|_1$ if the elements of the matrix A are known with an absolute error of 0.01:

$$A \approx \begin{pmatrix} -4 & 1 \\ 9 & 4 \end{pmatrix}$$

5. Use simple iteration method for finding the solution of the given linear system

$$\begin{cases} 25x + 6y + 8z = 1, \\ 9x + 26y + 4z = 3, \\ 1x + 4y + 20z = 7. \end{cases}$$

   Determine the iteration number after which the approximation error for each coordinate does not exceed 0.01 and find the corresponding approximate solution. Start with $x_0 = [0, 0, 0]^T$.

6. Find the most influential vertex in the graph using the PageRank algorithm with $\beta = 0.15$, where the graph adjacency matrix is defined as follows

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

7. Find the value $f(A)$ of the function $f(l) = ln(l + 5)$, where

$$A = \begin{pmatrix} 3 & -4 & -5 \\ -1 & 12 & 11 \\ 1 & -7 & -6 \end{pmatrix}$$

Variant 86

1. Find the best approximation matrix A_1 of rank 2 of the matrix A in the norm $||\cdot||_2$ and find $||A - A_1||_2$, where

$$A = \begin{bmatrix} 68 & -37 & -24 & 44 \\ 46 & -26 & 0 & -104 \\ -100 & -22 & -12 & 8 \end{bmatrix}$$

2. Estimate the relative error of the approximate solution $(1, 1)$ of the system $AX = b$ in the norms $|\cdot|_1$ and $|\cdot|_2$ using the condition number of the matrix A, where

$$A = \begin{pmatrix} 1.08 & 0.14 \\ 5.07 & -7.07 \end{pmatrix}, b = \begin{pmatrix} 1.09 \\ -1.91 \end{pmatrix}$$

3. Solve the system approximately and estimate the error of the solution in the norms $|\cdot|_1, |\cdot|_2, |\cdot|_\infty$:

$$\begin{cases} (-6 + \varepsilon_1)x + 3(4 + \varepsilon_2)y = -4 + \varepsilon_3 \\ -5x + (4 + \varepsilon_1)y = 1 + \varepsilon_4, \end{cases}$$

   where the unknown numbers ε_j satisfy the conditions $|\varepsilon_j| < 0.05$ for all $j = 1, \ldots, 4$.

4. Find the approximate inverse matrix to the matrix A and evaluate the approximation error with respect to the uniform norm $\|\cdot\|_1$ if the elements of the matrix A are known with an absolute error of 0.01:

$$A \approx \begin{pmatrix} -1 & -6 \\ -7 & 8 \end{pmatrix}$$

5. Use simple iteration method for finding the solution of the given linear system

$$\begin{cases} 24x + 5y + 4z = 8, \\ 8x + 24y + 3z = 8, \\ 3x + 9y + 24z = 2. \end{cases}$$

   Determine the iteration number after which the approximation error for each coordinate does not exceed 0.01 and find the corresponding approximate solution. Start with $x_0 = [0, 0, 0]^T$.

6. Find the most influential vertex in the graph using the PageRank algorithm with $\beta = 0.15$, where the graph adjacency matrix is defined as follows

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

7. Find the value $f(A)$ of the function $f(l) = ln(l + 2)$, where

$$A = \begin{pmatrix} -8 & -8 & -7 \\ 34 & 30 & 25 \\ -20 & -16 & -12 \end{pmatrix}$$

Variant 87

1. Find the best approximation matrix A_1 of rank 2 of the matrix A in the norm $||\cdot||_2$ and find $||A - A_1||_2$, where

$$A = \begin{bmatrix} -26 & 0 & 46 & -104 \\ -22 & -12 & -100 & 8 \\ -37 & -24 & 68 & 44 \end{bmatrix}$$

2. Estimate the relative error of the approximate solution $(1, 1)$ of the system $AX = b$ in the norms $|\cdot|_1$ and $|\cdot|_2$ using the condition number of the matrix A, where

$$A = \begin{pmatrix} -2.06 & 0.14 \\ 1.11 & -1.08 \end{pmatrix}, b = \begin{pmatrix} -2.05 \\ -0.06 \end{pmatrix}$$

3. Solve the system approximately and estimate the error of the solution in the norms $|\cdot|_1, |\cdot|_2, |\cdot|_\infty$:

$$\begin{cases} -2(4 + \varepsilon_1)x + 2(4 + \varepsilon_2)y = -4 + \varepsilon_3 \\ -2x + (-3 + \varepsilon_1)y = -1 + \varepsilon_4, \end{cases}$$

   where the unknown numbers ε_j satisfy the conditions $|\varepsilon_j| < 0.05$ for all $j = 1, \ldots, 4$.

4. Find the approximate inverse matrix to the matrix A and evaluate the approximation error with respect to the uniform norm $\|\cdot\|_1$ if the elements of the matrix A are known with an absolute error of 0.01:

$$A \approx \begin{pmatrix} -3 & -3 \\ -5 & 9 \end{pmatrix}$$

5. Use simple iteration method for finding the solution of the given linear system

$$\begin{cases} 26x + 7y + 4z = 2, \\ 3x + 26y + 5z = 2, \\ 8x + 6y + 24z = 3. \end{cases}$$

   Determine the iteration number after which the approximation error for each coordinate does not exceed 0.01 and find the corresponding approximate solution. Start with $x_0 = [0, 0, 0]^T$.

6. Find the most influential vertex in the graph using the PageRank algorithm with $\beta = 0.15$, where the graph adjacency matrix is defined as follows

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

7. Find the value $f(A)$ of the function $f(l) = e^{l+2}$, where

$$A = \begin{pmatrix} 19 & 3 & 2 \\ -67 & -10 & -7 \\ -17 & -3 & 0 \end{pmatrix}$$

Variant 88

1. Find the best approximation matrix A_1 of rank 2 of the matrix A in the norm $||\cdot||_2$ and find $||A - A_1||_2$, where

$$A = \begin{bmatrix} 82 & 56 & -34 & -54 \\ 53 & -128 & -2 & -36 \\ -122 & 8 & -19 & -36 \end{bmatrix}$$

2. Estimate the relative error of the approximate solution $(1, 1)$ of the system $AX = b$ in the norms $|\cdot|_1$ and $|\cdot|_2$ using the condition number of the matrix A, where

$$A = \begin{pmatrix} 5.01 & 0.0 \\ 0.93 & -2.81 \end{pmatrix}, b = \begin{pmatrix} 4.86 \\ -2.05 \end{pmatrix}$$

3. Solve the system approximately and estimate the error of the solution in the norms $|\cdot|_1, |\cdot|_2, |\cdot|_\infty$:

$$\begin{cases} 2(4 + \varepsilon_1)x + 2(-3 + \varepsilon_2)y = -5 + \varepsilon_3 \\ 3x + (-1 + \varepsilon_1)y = -3 + \varepsilon_4, \end{cases}$$

   where the unknown numbers ε_j satisfy the conditions $|\varepsilon_j| < 0.05$ for all $j = 1, \ldots, 4$.

4. Find the approximate inverse matrix to the matrix A and evaluate the approximation error with respect to the uniform norm $\|\cdot\|_1$ if the elements of the matrix A are known with an absolute error of 0.01:

$$A \approx \begin{pmatrix} 4 & 5 \\ 1 & -3 \end{pmatrix}$$

5. Use simple iteration method for finding the solution of the given linear system

$$\begin{cases} 27x + 8y + 5z = 9, \\ 3x + 27y + 4z = 8, \\ 4x + 4y + 19z = 5. \end{cases}$$

   Determine the iteration number after which the approximation error for each coordinate does not exceed 0.01 and find the corresponding approximate solution. Start with $x_0 = [0, 0, 0]^T$.

6. Find the most influential vertex in the graph using the PageRank algorithm with $\beta = 0.15$, where the graph adjacency matrix is defined as follows

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

7. Find the value $f(A)$ of the function $f(l) = ln(l + 5)$, where

$$A = \begin{pmatrix} -5 & -3 & 4 \\ 15 & 9 & -8 \\ -3 & -1 & 4 \end{pmatrix}$$

Variant 89

1. Find the best approximation matrix A_1 of rank 2 of the matrix A in the norm $||\cdot||_2$ and find $||A - A_1||_2$, where

$$A = \begin{bmatrix} -78 & -40 & 90 & -34 \\ 12 & 68 & -81 & 98 \\ 51 & -74 & -72 & -128 \end{bmatrix}$$

2. Estimate the relative error of the approximate solution $(1, 1)$ of the system $AX = b$ in the norms $|\cdot|_1$ and $|\cdot|_2$ using the condition number of the matrix A, where

$$A = \begin{pmatrix} -2.04 & -0.02 \\ 0.04 & -2.8 \end{pmatrix}, b = \begin{pmatrix} -2.06 \\ -3.09 \end{pmatrix}$$

3. Solve the system approximately and estimate the error of the solution in the norms $|\cdot|_1, |\cdot|_2, |\cdot|_\infty$:

$$\begin{cases} -2(2 + \varepsilon_1)x + 4(3 + \varepsilon_2)y = -3 + \varepsilon_3 \\ 1x + (2 + \varepsilon_1)y = -5 + \varepsilon_4, \end{cases}$$

   where the unknown numbers ε_j satisfy the conditions $|\varepsilon_j| < 0.05$ for all $j = 1, \ldots, 4$.

4. Find the approximate inverse matrix to the matrix A and evaluate the approximation error with respect to the uniform norm $\|\cdot\|_1$ if the elements of the matrix A are known with an absolute error of 0.01:

$$A \approx \begin{pmatrix} -3 & -7 \\ 3 & 1 \end{pmatrix}$$

5. Use simple iteration method for finding the solution of the given linear system

$$\begin{cases} 25x + 4y + 2z = 2, \\ 3x + 25y + 8z = 5, \\ 8x + 7y + 22z = 2. \end{cases}$$

   Determine the iteration number after which the approximation error for each coordinate does not exceed 0.01 and find the corresponding approximate solution. Start with $x_0 = [0, 0, 0]^T$.

6. Find the most influential vertex in the graph using the PageRank algorithm with $\beta = 0.15$, where the graph adjacency matrix is defined as follows

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

7. Find the value $f(A)$ of the function $f(l) = ln(l + 6)$, where

$$A = \begin{pmatrix} -19 & -5 & 6 \\ -25 & -4 & 7 \\ -100 & -25 & 31 \end{pmatrix}$$

Variant 90

1. Find the best approximation matrix A_1 of rank 2 of the matrix A in the norm $||\cdot||_2$ and find $||A - A_1||_2$, where

$$A = \begin{bmatrix} 34 & 48 & -29 & -44 \\ 22 & -36 & 34 & 40 \\ -49 & -60 & -46 & 8 \end{bmatrix}$$

2. Estimate the relative error of the approximate solution $(1, 1)$ of the system $AX = b$ in the norms $|\cdot|_1$ and $|\cdot|_2$ using the condition number of the matrix A, where

$$A = \begin{pmatrix} 1.99 & -0.04 \\ -1.93 & -6.83 \end{pmatrix}, b = \begin{pmatrix} 2.09 \\ -9.08 \end{pmatrix}$$

3. Solve the system approximately and estimate the error of the solution in the norms $|\cdot|_1, |\cdot|_2, |\cdot|_\infty$:

$$\begin{cases} 3(-4 + \varepsilon_1)x + 4(-3 + \varepsilon_2)y = -1 + \varepsilon_3 \\ 2x + (4 + \varepsilon_1)y = -5 + \varepsilon_4, \end{cases}$$

   where the unknown numbers ε_j satisfy the conditions $|\varepsilon_j| < 0.05$ for all $j = 1, \ldots, 4$.

4. Find the approximate inverse matrix to the matrix A and evaluate the approximation error with respect to the uniform norm $\|\cdot\|_1$ if the elements of the matrix A are known with an absolute error of 0.01:

$$A \approx \begin{pmatrix} -4 & -4 \\ 8 & 5 \end{pmatrix}$$

5. Use simple iteration method for finding the solution of the given linear system

$$\begin{cases} 20x + 5y + 4z = 9, \\ 1x + 23y + 7z = 4, \\ 1x + 5y + 19z = 8. \end{cases}$$

   Determine the iteration number after which the approximation error for each coordinate does not exceed 0.01 and find the corresponding approximate solution. Start with $x_0 = [0, 0, 0]^T$.

6. Find the most influential vertex in the graph using the PageRank algorithm with $\beta = 0.15$, where the graph adjacency matrix is defined as follows

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

7. Find the value $f(A)$ of the function $f(l) = ln(l + 7)$, where

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

Variant 91

1. Find the best approximation matrix A_1 of rank 2 of the matrix A in the norm $||\cdot||_2$ and find $||A - A_1||_2$, where

$$A = \begin{bmatrix} 70 & -102 & 60 & -59 \\ 52 & 96 & -66 & 46 \\ -118 & 12 & -96 & -82 \end{bmatrix}$$

2. Estimate the relative error of the approximate solution $(1, 1)$ of the system $AX = b$ in the norms $|\cdot|_1$ and $|\cdot|_2$ using the condition number of the matrix A, where

$$A = \begin{pmatrix} 0.97 & 0.14 \\ 6.81 & -4.09 \end{pmatrix}, b = \begin{pmatrix} 1.13 \\ 3.04 \end{pmatrix}$$

3. Solve the system approximately and estimate the error of the solution in the norms $|\cdot|_1, |\cdot|_2, |\cdot|_\infty$:

$$\begin{cases} (2 + \varepsilon_1)x + 3(-2 + \varepsilon_2)y = -2 + \varepsilon_3 \\ -5x + (-4 + \varepsilon_1)y = 4 + \varepsilon_4, \end{cases}$$

   where the unknown numbers ε_j satisfy the conditions $|\varepsilon_j| < 0.05$ for all $j = 1, \ldots, 4$.

4. Find the approximate inverse matrix to the matrix A and evaluate the approximation error with respect to the uniform norm $\|\cdot\|_1$ if the elements of the matrix A are known with an absolute error of 0.01:

$$A \approx \begin{pmatrix} 0 & -8 \\ -2 & -4 \end{pmatrix}$$

5. Use simple iteration method for finding the solution of the given linear system

$$\begin{cases} 25x + 3y + 3z = 5, \\ 6x + 21y + 2z = 5, \\ 7x + 5y + 20z = 6. \end{cases}$$

   Determine the iteration number after which the approximation error for each coordinate does not exceed 0.01 and find the corresponding approximate solution. Start with $x_0 = [0, 0, 0]^T$.

6. Find the most influential vertex in the graph using the PageRank algorithm with $\beta = 0.15$, where the graph adjacency matrix is defined as follows

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

7. Find the value $f(A)$ of the function $f(l) = ln(l + 6)$, where

$$A = \begin{pmatrix} 3 & 3 & 2 \\ 4 & 1 & 1 \\ -8 & 6 & 2 \end{pmatrix}$$

Variant 92

1. Find the best approximation matrix A_1 of rank 2 of the matrix A in the norm $||\cdot||_2$ and find $||A - A_1||_2$, where

$$A = \begin{bmatrix} 56 & 30 & -22 & 4 \\ -44 & 63 & -26 & -40 \\ -16 & -66 & 35 & -20 \end{bmatrix}$$

2. Estimate the relative error of the approximate solution $(1, 1)$ of the system $AX = b$ in the norms $|\cdot|_1$ and $|\cdot|_2$ using the condition number of the matrix A, where

$$A = \begin{pmatrix} 4.02 & 0.0 \\ 3.9 & -8.14 \end{pmatrix}, b = \begin{pmatrix} 4.2 \\ -3.96 \end{pmatrix}$$

3. Solve the system approximately and estimate the error of the solution in the norms $|\cdot|_1, |\cdot|_2, |\cdot|_\infty$:

$$\begin{cases} 4(-8 + \varepsilon_1)x + 3(3 + \varepsilon_2)y = 1 + \varepsilon_3 \\ -4x + (4 + \varepsilon_1)y = -1 + \varepsilon_4, \end{cases}$$

   where the unknown numbers ε_j satisfy the conditions $|\varepsilon_j| < 0.05$ for all $j = 1, \ldots, 4$.

4. Find the approximate inverse matrix to the matrix A and evaluate the approximation error with respect to the uniform norm $\|\cdot\|_1$ if the elements of the matrix A are known with an absolute error of 0.01:

$$A \approx \begin{pmatrix} -3 & 2 \\ -2 & 8 \end{pmatrix}$$

5. Use simple iteration method for finding the solution of the given linear system

$$\begin{cases} 23x + 8y + 9z = 6, \\ 1x + 26y + 4z = 7, \\ 1x + 6y + 19z = 5. \end{cases}$$

   Determine the iteration number after which the approximation error for each coordinate does not exceed 0.01 and find the corresponding approximate solution. Start with $x_0 = [0, 0, 0]^T$.

6. Find the most influential vertex in the graph using the PageRank algorithm with $\beta = 0.15$, where the graph adjacency matrix is defined as follows

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

7. Find the value $f(A)$ of the function $f(l) = e^{l+2}$, where

$$A = \begin{pmatrix} 3 & -5 & -4 \\ 4 & 3 & 4 \\ -4 & 0 & -1 \end{pmatrix}$$

Variant 93

1. Find the best approximation matrix A_1 of rank 2 of the matrix A in the norm $||\cdot||_2$ and find $||A - A_1||_2$, where

$$A = \begin{bmatrix} -2 & -71 & -16 & 12 \\ 46 & 70 & 74 & -24 \\ -88 & -52 & -53 & -30 \end{bmatrix}$$

2. Estimate the relative error of the approximate solution $(1, 1)$ of the system $AX = b$ in the norms $|\cdot|_1$ and $|\cdot|_2$ using the condition number of the matrix A, where

$$A = \begin{pmatrix} 1.97 & 0.04 \\ 7.09 & -2.05 \end{pmatrix}, b = \begin{pmatrix} 1.86 \\ 5.04 \end{pmatrix}$$

3. Solve the system approximately and estimate the error of the solution in the norms $|\cdot|_1, |\cdot|_2, |\cdot|_\infty$:

$$\begin{cases} 2(6 + \varepsilon_1)x + 3(-4 + \varepsilon_2)y = -4 + \varepsilon_3 \\ 4x + (3 + \varepsilon_1)y = 4 + \varepsilon_4, \end{cases}$$

   where the unknown numbers ε_j satisfy the conditions $|\varepsilon_j| < 0.05$ for all $j = 1, \ldots, 4$.

4. Find the approximate inverse matrix to the matrix A and evaluate the approximation error with respect to the uniform norm $\|\cdot\|_1$ if the elements of the matrix A are known with an absolute error of 0.01:

$$A \approx \begin{pmatrix} -9 & 8 \\ -2 & -6 \end{pmatrix}$$

5. Use simple iteration method for finding the solution of the given linear system

$$\begin{cases} 19x + 3y + 3z = 9, \\ 4x + 25y + 3z = 7, \\ 7x + 4y + 26z = 5. \end{cases}$$

   Determine the iteration number after which the approximation error for each coordinate does not exceed 0.01 and find the corresponding approximate solution. Start with $x_0 = [0, 0, 0]^T$.

6. Find the most influential vertex in the graph using the PageRank algorithm with $\beta = 0.15$, where the graph adjacency matrix is defined as follows

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

7. Find the value $f(A)$ of the function $f(l) = e^{l+1}$, where

$$A = \begin{pmatrix} -10 & -5 & -6 \\ 21 & 11 & 11 \\ 11 & 5 & 7 \end{pmatrix}$$

Variant 94

1. Find the best approximation matrix A_1 of rank 2 of the matrix A in the norm $||\cdot||_2$ and find $||A - A_1||_2$, where

$$A = \begin{bmatrix} 52 & 18 & -48 & -38 \\ 14 & -90 & 30 & -55 \\ -86 & 27 & 6 & 34 \end{bmatrix}$$

2. Estimate the relative error of the approximate solution $(1, 1)$ of the system $AX = b$ in the norms $|\cdot|_1$ and $|\cdot|_2$ using the condition number of the matrix A, where

$$A = \begin{pmatrix} -4.99 & 0.06 \\ 1.95 & -8.01 \end{pmatrix}, b = \begin{pmatrix} -4.83 \\ -6.04 \end{pmatrix}$$

3. Solve the system approximately and estimate the error of the solution in the norms $|\cdot|_1, |\cdot|_2, |\cdot|_\infty$:

$$\begin{cases} -5(6 + \varepsilon_1)x + 4(-4 + \varepsilon_2)y = -2 + \varepsilon_3 \\ 3x + (3 + \varepsilon_1)y = -1 + \varepsilon_4, \end{cases}$$

   where the unknown numbers ε_j satisfy the conditions $|\varepsilon_j| < 0.05$ for all $j = 1, \ldots, 4$.

4. Find the approximate inverse matrix to the matrix A and evaluate the approximation error with respect to the uniform norm $\|\cdot\|_1$ if the elements of the matrix A are known with an absolute error of 0.01:

$$A \approx \begin{pmatrix} -8 & -1 \\ 1 & -3 \end{pmatrix}$$

5. Use simple iteration method for finding the solution of the given linear system

$$\begin{cases} 27x + 3y + 7z = 1, \\ 6x + 26y + 7z = 4, \\ 1x + 7y + 26z = 5. \end{cases}$$

   Determine the iteration number after which the approximation error for each coordinate does not exceed 0.01 and find the corresponding approximate solution. Start with $x_0 = [0, 0, 0]^T$.

6. Find the most influential vertex in the graph using the PageRank algorithm with $\beta = 0.15$, where the graph adjacency matrix is defined as follows

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

7. Find the value $f(A)$ of the function $f(l) = ln(l + 7)$, where

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

Variant 95

1. Find the best approximation matrix A_1 of rank 2 of the matrix A in the norm $||\cdot||_2$ and find $||A - A_1||_2$, where

$$A = \begin{bmatrix} 4 & -4 & -48 & -2 \\ -28 & 34 & 6 & 11 \\ -10 & -32 & 0 & 26 \end{bmatrix}$$

2. Estimate the relative error of the approximate solution $(1, 1)$ of the system $AX = b$ in the norms $|\cdot|_1$ and $|\cdot|_2$ using the condition number of the matrix A, where

$$A = \begin{pmatrix} -4.06 & -0.11 \\ 2.85 & -5.96 \end{pmatrix}, b = \begin{pmatrix} -3.97 \\ -3.0 \end{pmatrix}$$

3. Solve the system approximately and estimate the error of the solution in the norms $|\cdot|_1, |\cdot|_2, |\cdot|_\infty$:

$$\begin{cases} -4(8 + \varepsilon_1)x + 4(-1 + \varepsilon_2)y = -4 + \varepsilon_3 \\ 2x + (-4 + \varepsilon_1)y = -2 + \varepsilon_4, \end{cases}$$

   where the unknown numbers ε_j satisfy the conditions $|\varepsilon_j| < 0.05$ for all $j = 1, \ldots, 4$.

4. Find the approximate inverse matrix to the matrix A and evaluate the approximation error with respect to the uniform norm $\|\cdot\|_1$ if the elements of the matrix A are known with an absolute error of 0.01:

$$A \approx \begin{pmatrix} -9 & -3 \\ -4 & -8 \end{pmatrix}$$

5. Use simple iteration method for finding the solution of the given linear system

$$\begin{cases} 19x + 3y + 7z = 6, \\ 4x + 24y + 5z = 5, \\ 5x + 3y + 27z = 2. \end{cases}$$

   Determine the iteration number after which the approximation error for each coordinate does not exceed 0.01 and find the corresponding approximate solution. Start with $x_0 = [0, 0, 0]^T$.

6. Find the most influential vertex in the graph using the PageRank algorithm with $\beta = 0.15$, where the graph adjacency matrix is defined as follows

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

7. Find the value $f(A)$ of the function $f(l) = e^{l+2}$, where

$$A = \begin{pmatrix} -11 & 10 & 11 \\ 0 & 3 & 1 \\ -16 & 12 & 15 \end{pmatrix}$$

Variant 96

1. Find the best approximation matrix A_1 of rank 2 of the matrix A in the norm $||\cdot||_2$ and find $||A - A_1||_2$, where

$$A = \begin{bmatrix} -20 & 10 & 11 & -18 \\ 14 & 8 & -26 & -24 \\ 4 & -32 & 2 & 12 \end{bmatrix}$$

2. Estimate the relative error of the approximate solution $(1, 1)$ of the system $AX = b$ in the norms $|\cdot|_1$ and $|\cdot|_2$ using the condition number of the matrix A, where

$$A = \begin{pmatrix} -4.97 & 0.17 \\ 0.85 & -3.01 \end{pmatrix}, b = \begin{pmatrix} -5.17 \\ -2.05 \end{pmatrix}$$

3. Solve the system approximately and estimate the error of the solution in the norms $|\cdot|_1, |\cdot|_2, |\cdot|_\infty$:

$$\begin{cases} -5(4 + \varepsilon_1)x + 4(1 + \varepsilon_2)y = -4 + \varepsilon_3 \\ 4x + (-2 + \varepsilon_1)y = -3 + \varepsilon_4, \end{cases}$$

   where the unknown numbers ε_j satisfy the conditions $|\varepsilon_j| < 0.05$ for all $j = 1, \ldots, 4$.

4. Find the approximate inverse matrix to the matrix A and evaluate the approximation error with respect to the uniform norm $\|\cdot\|_1$ if the elements of the matrix A are known with an absolute error of 0.01:

$$A \approx \begin{pmatrix} -8 & -6 \\ -2 & -2 \end{pmatrix}$$

5. Use simple iteration method for finding the solution of the given linear system

$$\begin{cases} 23x + 9y + 2z = 5, \\ 6x + 27y + 5z = 4, \\ 2x + 3y + 22z = 1. \end{cases}$$

   Determine the iteration number after which the approximation error for each coordinate does not exceed 0.01 and find the corresponding approximate solution. Start with $x_0 = [0, 0, 0]^T$.

6. Find the most influential vertex in the graph using the PageRank algorithm with $\beta = 0.15$, where the graph adjacency matrix is defined as follows

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

7. Find the value $f(A)$ of the function $f(l) = e^{l+3}$, where

$$A = \begin{pmatrix} -1 & -5 & -6 \\ -9 & -4 & -9 \\ 9 & 9 & 14 \end{pmatrix}$$

Variant 97

1. Find the best approximation matrix A_1 of rank 2 of the matrix A in the norm $||\cdot||_2$ and find $||A - A_1||_2$, where

$$A = \begin{bmatrix} -28 & -12 & 10 & -23 \\ -2 & 9 & -28 & -16 \\ 16 & -30 & -4 & 14 \end{bmatrix}$$

2. Estimate the relative error of the approximate solution $(1, 1)$ of the system $AX = b$ in the norms $|\cdot|_1$ and $|\cdot|_2$ using the condition number of the matrix A, where

$$A = \begin{pmatrix} 5.01 & -0.19 \\ 8.15 & -7.95 \end{pmatrix}, b = \begin{pmatrix} 5.0 \\ 0.01 \end{pmatrix}$$

3. Solve the system approximately and estimate the error of the solution in the norms $|\cdot|_1, |\cdot|_2, |\cdot|_\infty$:

$$\begin{cases} -4(-4 + \varepsilon_1)x + 4(2 + \varepsilon_2)y = 3 + \varepsilon_3 \\ -3x + (2 + \varepsilon_1)y = -2 + \varepsilon_4, \end{cases}$$

   where the unknown numbers ε_j satisfy the conditions $|\varepsilon_j| < 0.05$ for all $j = 1, \ldots, 4$.

4. Find the approximate inverse matrix to the matrix A and evaluate the approximation error with respect to the uniform norm $\|\cdot\|_1$ if the elements of the matrix A are known with an absolute error of 0.01:

$$A \approx \begin{pmatrix} 6 & -6 \\ -9 & -8 \end{pmatrix}$$

5. Use simple iteration method for finding the solution of the given linear system

$$\begin{cases} 27x + 6y + 4z = 4, \\ 5x + 21y + 3z = 4, \\ 4x + 5y + 20z = 4. \end{cases}$$

   Determine the iteration number after which the approximation error for each coordinate does not exceed 0.01 and find the corresponding approximate solution. Start with $x_0 = [0, 0, 0]^T$.

6. Find the most influential vertex in the graph using the PageRank algorithm with $\beta = 0.15$, where the graph adjacency matrix is defined as follows

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

7. Find the value $f(A)$ of the function $f(l) = e^{l+1}$, where

$$A = \begin{pmatrix} 0 & 5 & -6 \\ 1 & 1 & 1 \\ 1 & -5 & 7 \end{pmatrix}$$

Variant 98

1. Find the best approximation matrix A_1 of rank 2 of the matrix A in the norm $||\cdot||_2$ and find $||A - A_1||_2$, where

$$A = \begin{bmatrix} -22 & 42 & -24 & 50 \\ -38 & -60 & -12 & -35 \\ 32 & -39 & 30 & 8 \end{bmatrix}$$

2. Estimate the relative error of the approximate solution $(1, 1)$ of the system $AX = b$ in the norms $|\cdot|_1$ and $|\cdot|_2$ using the condition number of the matrix A, where

$$A = \begin{pmatrix} -1.06 & 0.01 \\ -2.08 & -1.81 \end{pmatrix}, b = \begin{pmatrix} -0.82 \\ -4.01 \end{pmatrix}$$

3. Solve the system approximately and estimate the error of the solution in the norms $|\cdot|_1, |\cdot|_2, |\cdot|_\infty$:

$$\begin{cases} -(-4 + \varepsilon_1)x + 2(-4 + \varepsilon_2)y = -4 + \varepsilon_3 \\ -3x + (1 + \varepsilon_1)y = 4 + \varepsilon_4, \end{cases}$$

   where the unknown numbers ε_j satisfy the conditions $|\varepsilon_j| < 0.05$ for all $j = 1, \ldots, 4$.

4. Find the approximate inverse matrix to the matrix A and evaluate the approximation error with respect to the uniform norm $\|\cdot\|_1$ if the elements of the matrix A are known with an absolute error of 0.01:

$$A \approx \begin{pmatrix} 3 & -4 \\ 3 & -1 \end{pmatrix}$$

5. Use simple iteration method for finding the solution of the given linear system

$$\begin{cases} 27x + 5y + 3z = 7, \\ 5x + 21y + 7z = 6, \\ 5x + 3y + 26z = 6. \end{cases}$$

   Determine the iteration number after which the approximation error for each coordinate does not exceed 0.01 and find the corresponding approximate solution. Start with $x_0 = [0, 0, 0]^T$.

6. Find the most influential vertex in the graph using the PageRank algorithm with $\beta = 0.15$, where the graph adjacency matrix is defined as follows

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

7. Find the value $f(A)$ of the function $f(l) = ln(l + 7)$, where

$$A = \begin{pmatrix} -1 & -8 & -7 \\ 4 & 7 & 4 \\ -4 & -1 & 2 \end{pmatrix}$$

Variant 99

1. Find the best approximation matrix A_1 of rank 2 of the matrix A in the norm $||\cdot||_2$ and find $||A - A_1||_2$, where

$$A = \begin{bmatrix} 82 & -24 & 0 & -48 \\ -2 & 12 & -54 & 60 \\ -79 & -30 & -54 & -24 \end{bmatrix}$$

2. Estimate the relative error of the approximate solution $(1, 1)$ of the system $AX = b$ in the norms $|\cdot|_1$ and $|\cdot|_2$ using the condition number of the matrix A, where

$$A = \begin{pmatrix} 0.98 & -0.1 \\ 0.11 & -0.92 \end{pmatrix}, b = \begin{pmatrix} 0.99 \\ -1.08 \end{pmatrix}$$

3. Solve the system approximately and estimate the error of the solution in the norms $|\cdot|_1, |\cdot|_2, |\cdot|_\infty$:

$$\begin{cases} (2 + \varepsilon_1)x + 2(4 + \varepsilon_2)y = -5 + \varepsilon_3 \\ -1x + (-3 + \varepsilon_1)y = -1 + \varepsilon_4, \end{cases}$$

   where the unknown numbers ε_j satisfy the conditions $|\varepsilon_j| < 0.05$ for all $j = 1, \ldots, 4$.

4. Find the approximate inverse matrix to the matrix A and evaluate the approximation error with respect to the uniform norm $\|\cdot\|_1$ if the elements of the matrix A are known with an absolute error of 0.01:

$$A \approx \begin{pmatrix} -3 & 4 \\ 6 & 7 \end{pmatrix}$$

5. Use simple iteration method for finding the solution of the given linear system

$$\begin{cases} 19x + 2y + 5z = 6, \\ 9x + 27y + 5z = 4, \\ 3x + 4y + 23z = 1. \end{cases}$$

   Determine the iteration number after which the approximation error for each coordinate does not exceed 0.01 and find the corresponding approximate solution. Start with $x_0 = [0, 0, 0]^T$.

6. Find the most influential vertex in the graph using the PageRank algorithm with $\beta = 0.15$, where the graph adjacency matrix is defined as follows

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

7. Find the value $f(A)$ of the function $f(l) = e^{l+1}$, where

$$A = \begin{pmatrix} 0 & -7 & 8 \\ -1 & -9 & 11 \\ -1 & -13 & 15 \end{pmatrix}$$

Variant 100

1. Find the best approximation matrix A_1 of rank 2 of the matrix A in the norm $||\cdot||_2$ and find $||A - A_1||_2$, where

$$A = \begin{bmatrix} -52 & 88 & -53 & -30 \\ 64 & -94 & -10 & -6 \\ -38 & 41 & -4 & 48 \end{bmatrix}$$

2. Estimate the relative error of the approximate solution $(1, 1)$ of the system $AX = b$ in the norms $|\cdot|_1$ and $|\cdot|_2$ using the condition number of the matrix A, where

$$A = \begin{pmatrix} 2.1 & 0.08 \\ 7.89 & -8.99 \end{pmatrix}, b = \begin{pmatrix} 2.11 \\ -1.07 \end{pmatrix}$$

3. Solve the system approximately and estimate the error of the solution in the norms $|\cdot|_1, |\cdot|_2, |\cdot|_\infty$:

$$\begin{cases} 2(-10 + \varepsilon_1)x + 2(-1 + \varepsilon_2)y = -2 + \varepsilon_3 \\ -1x + (3 + \varepsilon_1)y = -5 + \varepsilon_4, \end{cases}$$

   where the unknown numbers ε_j satisfy the conditions $|\varepsilon_j| < 0.05$ for all $j = 1, \ldots, 4$.

4. Find the approximate inverse matrix to the matrix A and evaluate the approximation error with respect to the uniform norm $\|\cdot\|_1$ if the elements of the matrix A are known with an absolute error of 0.01:

$$A \approx \begin{pmatrix} -9 & 9 \\ 9 & -5 \end{pmatrix}$$

5. Use simple iteration method for finding the solution of the given linear system

$$\begin{cases} 21x + 6y + 4z = 6, \\ 7x + 27y + 8z = 1, \\ 5x + 1y + 24z = 3. \end{cases}$$

   Determine the iteration number after which the approximation error for each coordinate does not exceed 0.01 and find the corresponding approximate solution. Start with $x_0 = [0, 0, 0]^T$.

6. Find the most influential vertex in the graph using the PageRank algorithm with $\beta = 0.15$, where the graph adjacency matrix is defined as follows

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

7. Find the value $f(A)$ of the function $f(l) = e^{l+3}$, where

$$A = \begin{pmatrix} 27 & 7 & 6 \\ -72 & -18 & -17 \\ -12 & -4 & -1 \end{pmatrix}$$