GH Vodafone LTE 22:54

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Flag question

The direct methods are methods that theoretically give the exact solution to a linear system in

Select one:

- a. an even number of steps.
- b. an infinite number of steps.
- c. a finite number of steps.
- d. none
- e. an odd number of steps.

Question **8**

Complete

Marked out of 1.00

Flag question

Provide all answers to four decimal places. Applying the Gauss-Jacobi method in solving the system of linear equation

$$\begin{pmatrix} 2 & 3 & 4 \\ 5 & 3 & 2 \\ 4 & 3 & 2 \end{pmatrix} \begin{pmatrix} x_1 \\ x_2 \\ x_3 \end{pmatrix} = \begin{pmatrix} 2 \\ -3 \\ 5 \end{pmatrix}$$ and

$$\begin{pmatrix} 1 \end{pmatrix}$$

Question 3

Complete

Marked out of 1.00

Flag question

Using the Gaussian elimination method to solve the system $5x_1 + x_2 + 2x_3 = 1$; $2x_1 + 6x_2 + 3x_3 = 3$; $3x_1 + 1x_2 + 5x_3 = 1$ what is the nature of the second multiplier matrix?

Select one:

a. $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & -1 & 1 \end{bmatrix}$

b. $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & -\frac{2}{14} & 1 \end{bmatrix}$

c. none

d. $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & \frac{1}{14} & 1 \end{bmatrix}$

e. $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & -\frac{1}{14} & 1 \end{bmatrix}$

When using the LU decomposition method to find the inverse of the matrix

$$A = \begin{bmatrix} 3 & 4 & 9 \\ 3 & 1 & 1 \\ 9 & 3 & 9 \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 \\ 1 & 1 & 0 \\ 3 & 3 & 1 \end{bmatrix} \begin{bmatrix} 3 & 4 & 9 \\ 0 & -3 & -8 \\ 0 & 0 & 6 \end{bmatrix}$$

The solution in the first column of the inverse matrix is obtained by solving the system

Select one:

a. none

b.
$$\begin{bmatrix} 1 & 0 & 0 \\ 2 & 1 & 0 \\ 0.5 & 3 & 1 \end{bmatrix} \begin{bmatrix} 4 & 1 & -1 \\ 0 & 1 & 5 \\ 0 & 0 & 3 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}$$

c.
$$\begin{bmatrix} 1 & 0 & 0 \\ 2 & 1 & 0 \\ 0.5 & 3 & 1 \end{bmatrix} \begin{bmatrix} 4 & 1 & -1 \\ 0 & 1 & 5 \\ 0 & 0 & 3 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} 0 \\ 1 \\ 0 \end{bmatrix}$$

d.
$$\begin{bmatrix} 1 & 0 & 0 \\ 1 & 1 & 0 \\ 3 & 3 & 1 \end{bmatrix} \begin{bmatrix} 3 & 4 & 9 \\ 0 & -3 & -8 \\ 0 & 0 & 6 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}$$

e.
$$\begin{bmatrix} 1 & 0 & 0 \\ 2 & 1 & 0 \\ 0.5 & 3 & 1 \end{bmatrix} \begin{bmatrix} 4 & 1 & -1 \\ 0 & 1 & 5 \\ 0 & 0 & 3 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix}$$

Given that $\begin{pmatrix} 1 & 0 & 0 & 0 \\ 2 & 1 & 0 & 0 \\ 2 & 3 & 5 & 0 \\ 5 & 2 & -1 & 2 \end{pmatrix} \begin{pmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{pmatrix} = \begin{pmatrix} 5 \\ 0 \\ 3 \\ 2 \end{pmatrix}$

then using the Forward substitution method

Select one:

a. $\begin{pmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{pmatrix} = \begin{pmatrix} 4 \\ 10 \\ 23/5 \\ 4/5 \end{pmatrix}$

b. none

c. $\begin{pmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{pmatrix} = \begin{pmatrix} 4 \\ -10 \\ 23/5 \\ 4/5 \end{pmatrix}$

d. $\begin{pmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{pmatrix} = \begin{pmatrix} 5 \\ 1 \\ -1 \\ 1/10 \end{pmatrix}$

e. $\begin{pmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{pmatrix} = \begin{pmatrix} 4 \\ -10 \\ 23/5 \\ -4/5 \end{pmatrix}$

Question 8

Complete

Marked out of 1.00

Flag question

Given that

$$\begin{pmatrix} -3 & 0 & 0 & 0 \\ -3 & -1 & 0 & 0 \\ 1 & -1 & -2 & 0 \\ -4 & -3 & -6 & -4 \end{pmatrix} \begin{pmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{pmatrix} = \begin{pmatrix} 1 \\ -3 \\ 2 \\ -2 \end{pmatrix}$$ then

using the Forward substitution method

Select one:

a. $\begin{pmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{pmatrix} = \begin{pmatrix} -1/3 \\ 4 \\ -19/6 \\ -31/12 \end{pmatrix}$

b. $\begin{pmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{pmatrix} = \begin{pmatrix} 3/4 \\ 7 \\ 0 \\ 41/3 \end{pmatrix}$

c. none

d. $\begin{pmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{pmatrix} = \begin{pmatrix} -1/3 \\ 4 \\ -19/6 \\ 31/12 \end{pmatrix}$

e. $\begin{pmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{pmatrix} = \begin{pmatrix} -1/3 \\ 4 \\ 19/6 \\ 31/12 \end{pmatrix}$

Using the Gaussian elimination method to solve the system $x_1 + 2x_2 + x_3 = 2$; $2x_1 + x_2 = 1$; $-x_1 + x_2 + 2x_3 = 2$ what is the nature of the first multiplier matrix?

Select one:

- a. none
- b. $\begin{bmatrix} 0 & 1 & 0 \\ 1 & -\frac{1}{2} & 0 \\ 0 & \frac{1}{2} & 1 \end{bmatrix}$
- c. $\begin{bmatrix} 0 & 1 & 0 \\ 1 & \frac{1}{2} & 0 \\ 0 & -\frac{1}{2} & 1 \end{bmatrix}$
- d. $\begin{bmatrix} 0 & 1 & 0 \\ 1 & \frac{1}{2} & 0 \\ 0 & \frac{1}{2} & 1 \end{bmatrix}$
- e. $\begin{bmatrix} 0 & 1 & 0 \\ 1 & -\frac{1}{2} & 0 \\ 0 & -\frac{1}{2} & 1 \end{bmatrix}$

Question 2

Complete

Marked out of 1.00

Flag question

Given the following linear system of equations, $-x_1 + 7x_2 - 4x_3 = 6$; $x_1 + 2x_2 + x_3 = -5$; $6x_1 - 5x_2 + 2x_3 = 17$, one can rewrite the above equations in matrix form as

Select one:

a. $\begin{bmatrix} 1 & 7 & 4 \\ 1 & 2 & 1 \\ 6 & -5 & 2 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} 6 \\ -5 \\ 17 \end{bmatrix}$

b. $\begin{bmatrix} -1 & 7 & 4 \\ 1 & 2 & 1 \\ 6 & 5 & 2 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} 6 \\ -5 \\ 17 \end{bmatrix}$

c. $\begin{bmatrix} -1 & 7 & -4 \\ 1 & 2 & 1 \\ 6 & 5 & 2 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} 6 \\ -5 \\ 17 \end{bmatrix}$

d. $\begin{bmatrix} -1 & 7 & -4 \\ 1 & 2 & 1 \\ 6 & -5 & 2 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} 6 \\ -5 \\ 17 \end{bmatrix}$

e. none

Question 3

Using the Gaussian elimination method to solve the system $x_1 - x_2 + x_3 = 5$; $7x_1 + 5x_2 - x_3 = 8$; $2x_1 + x_2 + x_3 = 7$ what is the nature of the first multiplier matrix?

Select one:

a. $\begin{bmatrix} 0 & 1 & 0 \\ 1 & -\frac{1}{7} & 0 \\ 0 & -\frac{2}{7} & 1 \end{bmatrix}$

b. $\begin{bmatrix} 1 & 0 & 0 \\ -2 & 1 & 0 \\ -\frac{1}{3} & 0 & 1 \end{bmatrix}$

c. $\begin{bmatrix} 1 & 0 & 0 \\ 2 & 1 & 0 \\ \frac{1}{3} & 0 & 1 \end{bmatrix}$

d. $\begin{bmatrix} 0 & 1 & 0 \\ 1 & \frac{1}{7} & 0 \\ 0 & \frac{2}{7} & 1 \end{bmatrix}$

e. none

Question **4**

Complete

Marked out of 1.00

Flag question

When using the LU decomposition method to find the inverse of the matrix

$$A=\begin{bmatrix}3&4&7\\1&1&1\\9&3&9\end{bmatrix}=\begin{bmatrix}1&0&0\\0.33&1&0\\3&27&1\end{bmatrix}\begin{bmatrix}3&4&7\\0&-0.33&-1.33\\0&0&24\end{bmatrix}$$

The solution in the first column of the inverse matrix is obtained by solving the system

Select one:

a.
$$\begin{bmatrix}1&0&0\\0.5&1&0\\3&27&1\end{bmatrix}\begin{bmatrix}3&4&7\\0&-0.33&-1.33\\0&0&24\end{bmatrix}\begin{bmatrix}x_1\\x_2\\x_3\end{bmatrix}=\begin{bmatrix}1\\0\\0\end{bmatrix}$$

b.
$$\begin{bmatrix}1&0&0\\0.33&1&0\\3&27&1\end{bmatrix}\begin{bmatrix}3&4&7\\0&-0.33&-1.33\\0&0&24\end{bmatrix}\begin{bmatrix}x_1\\x_2\\x_3\end{bmatrix}=\begin{bmatrix}1\\0\\0\end{bmatrix}$$

c.
$$\begin{bmatrix}1&0&0\\2&1&0\\0.5&3&1\end{bmatrix}\begin{bmatrix}4&1&-1\\0&1&5\\0&0&3\end{bmatrix}\begin{bmatrix}x_1\\x_2\\x_3\end{bmatrix}=\begin{bmatrix}1\\1\\1\end{bmatrix}$$

d. none

e.

Provide all answers to four decimal places.
Applying the Gauss-Jacobi method in solving the system of linear equation

$$\begin{pmatrix} 2 & 3 & 4 \\ 5 & 3 & 2 \\ 4 & 3 & 2 \end{pmatrix} \begin{pmatrix} x_1 \\ x_2 \\ x_3 \end{pmatrix} = \begin{pmatrix} 2 \\ -3 \\ 5 \end{pmatrix}$$ and

$$X^{(0)} = \begin{pmatrix} 1 \\ -1 \\ 0 \end{pmatrix}.$$

i. $A = L + D + U$ such that

- $L = \begin{pmatrix} 1 & 0 & 0 \\ 5 & 1 & 0 \\ 4 & 3 & 1 \end{pmatrix}$ $D = \begin{pmatrix} 2 & 0 & 0 \\ 0 & 3 & 0 \\ 0 & 0 & 2 \end{pmatrix}$ $U = \begin{pmatrix} 2 & 3 & 4 \\ 0 & 3 & 2 \\ 0 & 0 & 2 \end{pmatrix}$
- $L = \begin{pmatrix} 2 & 0 & 0 \\ 5 & 3 & 0 \\ 4 & 3 & 2 \end{pmatrix}$ $D = \begin{pmatrix} 2 & 0 & 0 \\ 0 & 3 & 0 \\ 0 & 0 & 2 \end{pmatrix}$ $U = \begin{pmatrix} 2 & 3 & 4 \\ 0 & 3 & 2 \\ 0 & 0 & 2 \end{pmatrix}$
- $L = \begin{pmatrix} 0 & 0 & 0 \\ 5 & 0 & 0 \\ 4 & 3 & 0 \end{pmatrix}$ $D = \begin{pmatrix} 2 & 0 & 0 \\ 0 & 3 & 0 \\ 0 & 0 & 2 \end{pmatrix}$ $U = \begin{pmatrix} 0 & 3 & 4 \\ 0 & 0 & 2 \\ 0 & 0 & 0 \end{pmatrix}$
- None of the options
- $L = \begin{pmatrix} 2 & 0 & 0 \\ 5 & 3 & 0 \\ 4 & 3 & 2 \end{pmatrix}$ $D = \begin{pmatrix} 2 & 0 & 0 \\ 0 & 3 & 0 \\ 0 & 0 & 2 \end{pmatrix}$ $U = \begin{pmatrix} 1 & 3 & 4 \\ 0 & 1 & 2 \\ 0 & 0 & 1 \end{pmatrix}$

ii. Given that the Gauss-Jacobi iterative scheme is represented as

Question **3**

Complete

Marked out of 1.00

Remove flag

The upper triangular matrix $[U]$ in the $[L][U]$ decomposition of the matrix given below

$$\begin{bmatrix} 15 & 5 & 4 \\ 10 & 4 & 16 \\ 8 & 12 & 22 \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 \\ l_{21} & 1 & 0 \\ l_{31} & l_{32} & 1 \end{bmatrix} \begin{bmatrix} u_{11} & u_{12} & u_{13} \\ 0 & u_{22} & u_{23} \\ 0 & 0 & u_{33} \end{bmatrix}$$

Select one:

a. $\begin{bmatrix} 15 & 5 & 4 \\ 0 & 0.4 & 18.20 \\ 0 & 0 & 0.32 \end{bmatrix}$

b. $\begin{bmatrix} 15 & 5 & 4 \\ 0 & 6 & 14.4 \\ 0 & 0 & -4.24 \end{bmatrix}$

c. $\begin{bmatrix} 15 & 5 & 4 \\ 0 & 0.6667 & 13.3333 \\ 0 & 0 & 10.0889 \end{bmatrix}$

d. $\begin{bmatrix} 1 & 0.2 & 0.16 \\ 0 & 1 & 2.4 \\ 0 & 0 & -4.24 \end{bmatrix}$

e. none

e. $\begin{bmatrix} 0 & 1.00012 & 14.4 \\ 0 & 0 & -94.24 \end{bmatrix}$

Question **7**

Complete

Marked out of 1.00

Flag question

Using partial pivoting in Gaussian elimination is redundant for

Select one:

- a. None
- b. diagonally dominant matrices
- c. singular matrices
- d. strictly upper triangular matrices
- e. strictly lower triangular matrices

Question **8**

Complete

Marked out of 1.00

Flag question

Flag question

Given that $\begin{pmatrix} 8 & 1 & 9 & 2 \\ 0 & 1 & 4 & 10 \\ 0 & 0 & 7 & 5 \\ 0 & 0 & 0 & 4 \end{pmatrix} \begin{pmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{pmatrix} = \begin{pmatrix} 21 \\ 13 \\ 8 \\ 14 \end{pmatrix}$ then using the Backward substitution method

Select one:

- a. $\begin{pmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{pmatrix} = \begin{pmatrix} 5.348 \\ -14.571 \\ -0.357 \\ 4.500 \end{pmatrix}$
- b. $\begin{pmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{pmatrix} = \begin{pmatrix} 5.348 \\ -16.571 \\ -1.357 \\ 3.500 \end{pmatrix}$
- c. $\begin{pmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{pmatrix} = \begin{pmatrix} 5.348 \\ -15.571 \\ 1.643 \\ 3.500 \end{pmatrix}$
- d. $\begin{pmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{pmatrix} = \begin{pmatrix} 7.348 \\ -14.571 \\ -1.357 \\ 6.500 \end{pmatrix}$
- e. none

Given that $\begin{pmatrix} 1 & 1 & 2 & 10 \\ 0 & 10 & 1 & 8 \\ 0 & 0 & 6 & 8 \\ 0 & 0 & 0 & 9 \end{pmatrix} \begin{pmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{pmatrix} = \begin{pmatrix} 14 \\ 21 \\ 7 \\ 16 \end{pmatrix}$

then using the Backward substitution method

Select one:

a. $\begin{pmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{pmatrix} = \begin{pmatrix} -2.169 \\ 0.798 \\ -1.204 \\ 1.778 \end{pmatrix}$

b. $\begin{pmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{pmatrix} = \begin{pmatrix} 0.831 \\ 1.798 \\ -0.204 \\ 3.778 \end{pmatrix}$

c. $\begin{pmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{pmatrix} = \begin{pmatrix} -2.169 \\ 3.798 \\ 1.796 \\ 2.778 \end{pmatrix}$

d. $\begin{pmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{pmatrix} = \begin{pmatrix} 2.831 \\ 1.798 \\ 1.796 \\ 1.778 \end{pmatrix}$

e. none

Question **8**

Question **5**

Complete

Marked out of 1.00

Flag question

Direct techniques give exact solution to the system in which number of steps?

Select one:

- a. infinite number of seps
- b. finite number of steps
- c. $(n+1)$ number of seps
- d. $(n-1)$ number of seps

Question **6**

Complete

Marked out of 1.00

Flag question

Given that $$\begin{pmatrix} 1 & 0 & 0 & 0 \\ 2 & 1 & 0 & 0 \\ 2 & 3 & 5 & 0 \\ 5 & 2 & -1 & 2 \end{pmatrix} \begin{pmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{pmatrix} = \begin{pmatrix} 5 \\ 0 \\ 3 \\ 2 \end{pmatrix}$$

then using the Forward substitution method

The upper triangular matrix $[U]$ in the $[L][U]$ decomposition of the matrix given below

$$\begin{bmatrix} 15 & 5 & 9 \\ 7 & 8 & 16 \\ 8 & 12 & 22 \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 \\ l_{21} & 1 & 0 \\ l_{31} & l_{32} & 1 \end{bmatrix} \begin{bmatrix} u_{11} & u_{12} & u_{13} \\ 0 & u_{22} & u_{23} \\ 0 & 0 & u_{33} \end{bmatrix}$$

Select one:

a. $\begin{bmatrix} 15 & 5 & 4 \\ 0 & 8.0012 & 16.4113 \\ 0 & 0 & -2.9 \end{bmatrix}$

b. none

c. $\begin{bmatrix} 55 & 5 & 4 \\ 0 & 6.7 & 14.4 \\ 0 & 0 & -4.24 \end{bmatrix}$

d. $\begin{bmatrix} 1 & 0.2 & 0.16 \\ 0 & 1 & 2.4 \\ 0 & 0 & -4.24 \end{bmatrix}$

e. $\begin{bmatrix} 15 & 5 & 4 \\ 0 & 5.6667 & 14.1333 \\ 0 & 0 & -3.4118 \end{bmatrix}$

Question 4

Complete

Marked out of 1.00

Flag question

Question **5**

Complete

Marked out of 1.00

Flag question

Given that $\begin{pmatrix} 2 & 0 & 0 & 0 \\ 7 & 4 & 0 & 0 \\ 3 & -1 & 4 & 0 \\ 7 & 4 & 5 & 3 \end{pmatrix} \begin{pmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{pmatrix} = \begin{pmatrix} 2 \\ 2 \\ 1 \\ 1 \end{pmatrix}$

then using the Forward substitution method

Select one:

- a. $\begin{pmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{pmatrix} = \begin{pmatrix} 1 \\ -5/4 \\ -13/16 \\ 48/49 \end{pmatrix}$
- b. $\begin{pmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{pmatrix} = \begin{pmatrix} 1 \\ -5/4 \\ 13/16 \\ 49/48 \end{pmatrix}$
- c. $\begin{pmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{pmatrix} = \begin{pmatrix} 1 \\ -15/4 \\ -13/16 \\ 49/48 \end{pmatrix}$
- d. none
- e. $\begin{pmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{pmatrix} = \begin{pmatrix} 1 \\ -5/4 \\ -13/16 \\ 49/48 \end{pmatrix}$

Question **6**

Complete

Marked out of 1.00

Flag question

The upper triangular matrix $[U]$ in the $[L][U]$ decomposition of the matrix given below

$$\begin{bmatrix} 15 & 5 & 4 \\ 7 & 4 & 16 \\ 8 & 12 & 22 \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 \\ l_{21} & 1 & 0 \\ l_{31} & l_{32} & 1 \end{bmatrix} \begin{bmatrix} u_{11} & u_{12} & u_{13} \\ 0 & u_{22} & u_{23} \\ 0 & 0 & u_{33} \end{bmatrix}$$

Select one:

a. $\begin{bmatrix} 12 & 0.2 & 0.16 \\ 0 & 0 & 2.4 \\ 0 & 0 & -4.24 \end{bmatrix}$

b. $\begin{bmatrix} 15 & 0 & 5 \\ 0.4 & 1 & 0 \\ 0.32 & 1.73 & 1 \end{bmatrix}$

c. $\begin{bmatrix} 15 & 5 & 4 \\ 0 & 1.6667 & 14.133 \\ 0 & 0 & -63.8027 \end{bmatrix}$

d. none

e. $\begin{bmatrix} 15 & 5 & 4 \\ 0 & 1.00012 & 14.4 \\ 0 & 0 & -94.24 \end{bmatrix}$

Marked out of 1.00

Flag question

Using the Gaussian elimination method to solve the system $x_1 + 4x_2 - x_3 = 4$; $2x_1 - 3x_2 + x_3 = 0$; $3x_1 + 2x_2 - 5x_3 = 0$ what is the nature of the first multiplier matrix?

Select one:

a. $\begin{bmatrix} 0 & 0 & 1 \\ 0 & 1 & -\frac{2}{3} \\ 1 & 0 & -\frac{1}{3} \end{bmatrix}$

b. none

c. $\begin{bmatrix} 0 & 0 & 1 \\ 0 & 1 & \frac{2}{3} \\ 1 & 0 & \frac{1}{3} \end{bmatrix}$

d. $\begin{bmatrix} 1 & 0 & 0 \\ \frac{2}{3} & 1 & 0 \\ 3 & 0 & 1 \end{bmatrix}$

e. $\begin{bmatrix} 1 & 0 & 0 \\ -\frac{2}{3} & 1 & 0 \\ -3 & 0 & 1 \end{bmatrix}$

Question 9

Complete

Marked out of 1.00

Flag question

A square matrix $[A]$ is lower triangular if

Select one:

- a. $a_{ij} \neq 0, i > j$
- b. $a_{ij} = 0, i > j$
- c. $a_{ij} = 0, j > i$
- d. $a_{ij} \neq 0, j > i$
- e. none

Finish review

Quiz navigation

)

iii. After the first iteration

$X^{(1)}$ = (

2.5

3.5

4.5

)

iv. After the second iteration

$X^{(2)}$ = (

3

4

5

)

v. After the third iteration

$X^{(3)}$ = (

3.5

4.5

5.5

)

Question 6

Complete

Marked out of 1.00

Flag question

The LU method decomposes the matrix A into a product of

Select one:

- a. a diagonal matrix and a symmetric matrix
- b. None
- c. a strictly lower triangular matrix and a unit upper triangular matrix
- d. a unit lower triangular matrix and an upper triangular matrix
- e. a strictly lower triangular matrix and an upper triangular matrix

Question 7

Complete

Marked out of 1.00

Flag question

When using the LU decomposition method to find the inverse of the matrix

$$A = \begin{bmatrix} 4 & 9 & 4 \\ 5 & 1 & 3 \\ 2 & 6 & 1 \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 \\ 1.25 & 1 & 0 \\ 0.5 & -0.15 & 1 \end{bmatrix} \begin{bmatrix} 4 & 9 & 4 \\ 0 & -10.25 & 2 \\ 0 & 0 & -1.30 \end{bmatrix}$$

The solution in the first column of the inverse matrix is obtained by solving the system

Select one:

a.
$$\begin{bmatrix} 1 & 0 & 0 \\ 1.25 & 1 & 0 \\ 0.5 & -0.15 & 1 \end{bmatrix} \begin{bmatrix} 4 & 9 & 4 \\ 0 & -10.25 & 2 \\ 0 & 0 & -1.30 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}$$

b.
$$\begin{bmatrix} 1 & 0 & 0 \\ 2 & 1 & 0 \\ 0.5 & 3 & 1 \end{bmatrix} \begin{bmatrix} 4 & 1 & -1 \\ 0 & 1 & 5 \\ 0 & 0 & 3 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}$$

c. none

d.
$$\begin{bmatrix} 1 & 0 & 0 \\ 2 & 1 & 0 \\ 0.5 & 3 & 1 \end{bmatrix} \begin{bmatrix} 4 & 1 & -1 \\ 0 & 1 & 5 \\ 0 & 0 & 3 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} 0 \\ 1 \\ 0 \end{bmatrix}$$

e.
$$\begin{bmatrix} 1 & 0 & 0 \\ 2 & 1 & 0 \\ 0.5 & 3 & 1 \end{bmatrix} \begin{bmatrix} 4 & 1 & -1 \\ 0 & 1 & 5 \\ 0 & 0 & 3 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix}$$

Provide all answers to four decimal places. Applying the Gauss-Jacobi method in solving the system of linear equation

$$\begin{pmatrix} 2 & 3 & 4 \\ 5 & 3 & 2 \\ 4 & 3 & 2 \end{pmatrix} \begin{pmatrix} x_1 \\ x_2 \\ x_3 \end{pmatrix} = \begin{pmatrix} 2 \\ -3 \\ 5 \end{pmatrix}$$ and

$$X^{(0)} = \begin{pmatrix} 1 \\ -1 \\ 0 \end{pmatrix}.$$

i. $A = L + D + U$ such that

- $L = \begin{pmatrix} 1 & 0 & 0 \\ 5 & 1 & 0 \\ 4 & 3 & 1 \end{pmatrix}$ $D = \begin{pmatrix} 2 & 0 & 0 \\ 0 & 3 & 0 \\ 0 & 0 & 2 \end{pmatrix}$ $U = \begin{pmatrix} 2 & 3 & 4 \\ 0 & 3 & 2 \\ 0 & 0 & 2 \end{pmatrix}$
- $L = \begin{pmatrix} 2 & 0 & 0 \\ 5 & 3 & 0 \\ 4 & 3 & 2 \end{pmatrix}$ $D = \begin{pmatrix} 2 & 0 & 0 \\ 0 & 3 & 0 \\ 0 & 0 & 2 \end{pmatrix}$ $U = \begin{pmatrix} 2 & 3 & 4 \\ 0 & 3 & 2 \\ 0 & 0 & 2 \end{pmatrix}$
- $L = \begin{pmatrix} 0 & 0 & 0 \\ 5 & 0 & 0 \\ 4 & 3 & 0 \end{pmatrix}$ $D = \begin{pmatrix} 2 & 0 & 0 \\ 0 & 3 & 0 \\ 0 & 0 & 2 \end{pmatrix}$ $U = \begin{pmatrix} 0 & 3 & 4 \\ 0 & 0 & 2 \\ 0 & 0 & 0 \end{pmatrix}$
- None of the options
- $L = \begin{pmatrix} 2 & 0 & 0 \\ 5 & 3 & 0 \\ 4 & 3 & 2 \end{pmatrix}$ $D = \begin{pmatrix} 2 & 0 & 0 \\ 0 & 3 & 0 \\ 0 & 0 & 2 \end{pmatrix}$ $U = \begin{pmatrix} 1 & 3 & 4 \\ 0 & 1 & 2 \\ 0 & 0 & 1 \end{pmatrix}$

ii. Given that the Gauss-Jacobi iterative scheme is represented as

Question **9**

Complete

Marked out of 1.00

Flag question

Given that $\begin{pmatrix} 2 & 5 & 5 & 3 \\ 0 & 10 & 6 & 8 \\ 0 & 0 & 8 & 8 \\ 0 & 0 & 0 & 1 \end{pmatrix} \begin{pmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{pmatrix} = \begin{pmatrix} 1 \\ 6 \\ 2 \\ 16 \end{pmatrix}$

then using the Backward substitution method

Select one:

a. $\begin{pmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{pmatrix} = \begin{pmatrix} 25.750 \\ -0.750 \\ -13.750 \\ 17.000 \end{pmatrix}$

b. $\begin{pmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{pmatrix} = \begin{pmatrix} 24.750 \\ -1.750 \\ -10.750 \\ 16.000 \end{pmatrix}$

c. $\begin{pmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{pmatrix} = \begin{pmatrix} 22.750 \\ -2.750 \\ -15.750 \\ 16.000 \end{pmatrix}$

d. $\begin{pmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{pmatrix} = \begin{pmatrix} 22.750 \\ -0.750 \\ -12.750 \\ 20.000 \end{pmatrix}$

Complete

Marked out of 1.00

Flag question

A square matrix $[A]$ is lower triangular if

Select one:

- a. $a_{ij} \neq 0, i > j$
- b. $a_{ij} \neq 0, j > i$
- c. none
- d. $a_{ij} = 0, j > i$
- e. $a_{ij} = 0, i > j$

Question **9**

Complete

Marked out of 1.00

Flag question

Provide all answers to four decimal places. Applying the Gauss-Jacobi method in solving the system of linear equation

$$\begin{pmatrix} 2 & 3 & 4 \\ 5 & 3 & 2 \\ 4 & 3 & 2 \end{pmatrix} \begin{pmatrix} x_1 \\ x_2 \\ x_3 \end{pmatrix} = \begin{pmatrix} 2 \\ -3 \\ 5 \end{pmatrix}$$ and

When using the LU decomposition method to find the inverse of the matrix

$$A = \begin{bmatrix} 3 & 4 & 8 \\ 1 & 1 & 1 \\ 9 & 3 & 9 \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 \\ 0.33 & 1 & 0 \\ 3 & 27 & 1 \end{bmatrix} \begin{bmatrix} 3 & 4 & 8 \\ 0 & -0.33 & -1.67 \\ 0 & 0 & 30 \end{bmatrix}$$

The solution in the first column of the inverse matrix is obtained by solving the system

Select one:

a.
$$\begin{bmatrix} 1 & 0 & 0 \\ 2 & 1 & 0 \\ 0.5 & 3 & 1 \end{bmatrix} \begin{bmatrix} 4 & 1 & -1 \\ 0 & 1 & 5 \\ 0 & 0 & 3 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}$$

b.
$$\begin{bmatrix} 1 & 0 & 0 \\ 0.33 & 1 & 0 \\ 3 & 27 & 1 \end{bmatrix} \begin{bmatrix} 3 & 4 & 8 \\ 0 & -0.33 & -1.67 \\ 0 & 0 & 30 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}$$

c.
$$\begin{bmatrix} 1 & 0 & 0 \\ 2 & 1 & 0 \\ 0.5 & 3 & 1 \end{bmatrix} \begin{bmatrix} 4 & 1 & -1 \\ 0 & 1 & 5 \\ 0 & 0 & 3 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix}$$

d. none

e.
$$\begin{bmatrix} 1 & 0 & 0 \\ 2 & 1 & 0 \\ 0.5 & 3 & 1 \end{bmatrix} \begin{bmatrix} 4 & 1 & -1 \\ 0 & 1 & 5 \\ 0 & 0 & 3 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} 0 \\ 1 \\ 0 \end{bmatrix}$$

Question **5**

Complete

Marked out of 1.00

Flag question

Given the following linear system of equations, $-x_1 + 7x_2 - 4x_3 = 6$; $x_1 + 2x_2 + x_3 = -5$; $6x_1 - 5x_2 + 2x_3 = 17$, one can rewrite the above equations in matrix form as

Select one:

a. $\begin{bmatrix} -1 & 7 & -4 \\ 1 & 2 & 1 \\ 6 & -5 & 2 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} 6 \\ -5 \\ 17 \end{bmatrix}$

b. none

c. $\begin{bmatrix} -1 & 7 & 4 \\ 1 & 2 & 1 \\ 6 & 5 & 2 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} 6 \\ -5 \\ 17 \end{bmatrix}$

d. $\begin{bmatrix} 1 & 7 & 4 \\ 1 & 2 & 1 \\ 6 & -5 & 2 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} 6 \\ -5 \\ 17 \end{bmatrix}$

e. $\begin{bmatrix} -1 & 7 & -4 \\ 1 & 2 & 1 \\ 6 & 5 & 2 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} 6 \\ -5 \\ 17 \end{bmatrix}$

Question 6

$$X^{(0)} = \begin{pmatrix} 1 \\ -1 \\ 0 \end{pmatrix}.$$

i. $A = L + D + U$ such that

- $L = \begin{pmatrix} 1 & 0 & 0 \\ 5 & 1 & 0 \\ 4 & 3 & 1 \end{pmatrix}$ $D = \begin{pmatrix} 2 & 0 & 0 \\ 0 & 3 & 0 \\ 0 & 0 & 2 \end{pmatrix}$ $U = \begin{pmatrix} 2 & 3 & 4 \\ 0 & 3 & 2 \\ 0 & 0 & 2 \end{pmatrix}$
- $L = \begin{pmatrix} 2 & 0 & 0 \\ 5 & 3 & 0 \\ 4 & 3 & 2 \end{pmatrix}$ $D = \begin{pmatrix} 2 & 0 & 0 \\ 0 & 3 & 0 \\ 0 & 0 & 2 \end{pmatrix}$ $U = \begin{pmatrix} 2 & 3 & 4 \\ 0 & 3 & 2 \\ 0 & 0 & 2 \end{pmatrix}$
- $L = \begin{pmatrix} 0 & 0 & 0 \\ 5 & 0 & 0 \\ 4 & 3 & 0 \end{pmatrix}$ $D = \begin{pmatrix} 2 & 0 & 0 \\ 0 & 3 & 0 \\ 0 & 0 & 2 \end{pmatrix}$ $U = \begin{pmatrix} 0 & 3 & 4 \\ 0 & 0 & 2 \\ 0 & 0 & 0 \end{pmatrix}$
- None of the options
- $L = \begin{pmatrix} 2 & 0 & 0 \\ 5 & 3 & 0 \\ 4 & 3 & 2 \end{pmatrix}$ $D = \begin{pmatrix} 2 & 0 & 0 \\ 0 & 3 & 0 \\ 0 & 0 & 2 \end{pmatrix}$ $U = \begin{pmatrix} 1 & 3 & 4 \\ 0 & 1 & 2 \\ 0 & 0 & 1 \end{pmatrix}$

ii. Given that the Gauss-Jacobi iterative scheme is represented as $X^{(k+1)} = T_{gj}X^{(k)} + Q_{gj}$ then T_{gj} =

0.5
1.0
1.5

Question 6

Complete

Marked out of 1.00

Flag question

Consider the system of linear equations $Ax = b$. The Gaussian elimination method reduces the matrix A to

Select one:

- a. None
- b. an upper triangular matrix
- c. a lower triangular matrix
- d. strictly upper triangular matrix
- e. a diagonal matrix

Question 7

Complete

Marked out of 1.00

Flag question

Given that $\begin{pmatrix} 1 & 1 & 2 & 10 \\ 0 & 10 & 1 & 8 \\ 0 & 0 & 6 & 8 \end{pmatrix} \begin{pmatrix} x_1 \\ x_2 \\ x_3 \end{pmatrix} = \begin{pmatrix} 14 \\ 21 \\ 7 \end{pmatrix}$