This print-out should have 7 questions. Multiple-choice questions may continue on the next column or page – find all choices before answering.

001 10.0 points

Determine the inverse of the matrix

$$A = \begin{bmatrix} 1 & 3 & 1 \\ 3 & 10 & 3 \\ 0 & -1 & 1 \end{bmatrix}.$$

1. $A^{-1} = \begin{bmatrix} 13 & -3 & -3 \\ -4 & 1 & 1 \\ -1 & 0 & 1 \end{bmatrix}$

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

3. $A^{-1} = \begin{bmatrix} 3 & -4 & -1 \\ -3 & 1 & 0 \\ -3 & 1 & -1 \end{bmatrix}$

4. $A^{-1} = \begin{bmatrix} 13 & -4 & -1 \\ -3 & 1 & 0 \\ -3 & 1 & 1 \end{bmatrix}$

002 10.0 points

Determine the inverse of the matrix

$$A = \begin{bmatrix} 1 & 2 & -1 \\ -2 & -3 & -1 \\ -2 & -2 & -3 \end{bmatrix}.$$

1. $A^{-1} = \begin{bmatrix} 7 & -4 & -2 \\ 8 & -5 & -2 \\ -5 & 3 & 1 \end{bmatrix}$

2. $A^{-1} = \begin{bmatrix} 3 & 8 & -5 \\ -4 & 1 & 3 \\ -2 & -2 & -1 \end{bmatrix}$

3. $A^{-1} = \begin{bmatrix} 7 & 8 & -5 \\ -4 & -5 & 3 \\ -2 & -2 & 1 \end{bmatrix}$

4. $A^{-1} = \begin{bmatrix} 3 & -4 & -2 \\ 8 & 1 & -2 \\ -5 & 3 & -1 \end{bmatrix}$

003 10.0 points

Solve for X when $AX + B = C$,

$$A = \begin{bmatrix} 2 & 1 \\ 3 & 2 \end{bmatrix}, \quad B = \begin{bmatrix} 4 & 2 \\ -1 & 3 \end{bmatrix},$$

and

$$C = \begin{bmatrix} 2 & 2 \\ 1 & 5 \end{bmatrix}.$$

1. $X = \begin{bmatrix} -6 & -2 \\ 10 & 4 \end{bmatrix}$

2. $X = \begin{bmatrix} -2 & -2 \\ 10 & -2 \end{bmatrix}$

3. $X = \begin{bmatrix} -6 & -2 \\ -5 & -4 \end{bmatrix}$

4. $X = \begin{bmatrix} -2 & -2 \\ -5 & 4 \end{bmatrix}$

5. $X = \begin{bmatrix} -6 & -2 \\ 2 & -2 \end{bmatrix}$

004 10.0 points

Determine the unique solution x_1 of the matrix equation

$$A\mathbf{x} = A \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} 11 \\ -11 \\ -9 \end{bmatrix}$$

when A has an LU-decomposition

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

1. $x_1 = -4$

2. $x_1 = -6$

3. $x_1 = -5$

4. $x_1 = -2$

5. $x_1 = -3$

005 10.0 points

Find U in an LU decomposition of

$$A = \begin{bmatrix} -3 & -3 & 2 & -3 \\ -15 & -15 & 14 & -17 \\ 15 & 15 & 6 & 6 \end{bmatrix}.$$

1. $U = \begin{bmatrix} -3 & 1 & 4 & -2 \\ 0 & 0 & 4 & -5 \\ 0 & 0 & 0 & -1 \end{bmatrix}$

2. $U = \begin{bmatrix} -3 & -3 & 2 & -3 \\ 0 & 0 & 4 & -2 \\ 0 & 0 & 0 & -1 \end{bmatrix}$

3. $U = \begin{bmatrix} 1 & 1 & 4 & -2 \\ 0 & 0 & 1 & -5 \\ 0 & 0 & 0 & 1 \end{bmatrix}$

4. $U = \begin{bmatrix} 1 & -3 & 2 & -3 \\ 0 & 0 & 1 & -2 \\ 0 & 0 & 0 & 1 \end{bmatrix}$

5. $U = \begin{bmatrix} 1 & 3 & -2 & 3 \\ 0 & 0 & 1 & 2 \\ 0 & 0 & 0 & 1 \end{bmatrix}$

6. $U = \begin{bmatrix} -3 & 3 & -2 & 3 \\ 0 & 0 & 4 & 2 \\ 0 & 0 & 0 & -1 \end{bmatrix}$

006 10.0 points

Determine the Unit Lower Triangular matrix L in the unique LU-decomposition of the matrix

$$A = \begin{bmatrix} -2 & 1 & -5 \\ 8 & 0 & 17 \\ -8 & -8 & -6 \end{bmatrix}.$$

1. $L = \begin{bmatrix} 1 & -4 & 4 \\ 0 & 1 & -3 \\ 0 & 0 & 1 \end{bmatrix}$

2. $L = \begin{bmatrix} -2 & 1 & -5 \\ 0 & 4 & -3 \\ 0 & 0 & 5 \end{bmatrix}$

3. $L = \begin{bmatrix} 1 & 0 & 0 \\ 1 & 1 & 0 \\ -5 & -3 & 1 \end{bmatrix}$

4. $L = \begin{bmatrix} 1 & 0 & 0 \\ -4 & 1 & 0 \\ 4 & -3 & 1 \end{bmatrix}$

5. $L = \begin{bmatrix} 1 & 1 & -5 \\ 0 & 1 & 17 \\ 0 & 0 & 1 \end{bmatrix}$

6. $L = \begin{bmatrix} 1 & 0 & 0 \\ 4 & 1 & 0 \\ -4 & 3 & 1 \end{bmatrix}$

007 10.0 points

Determine the lower triangular matrix L in an LU-decomposition of

$$A = \begin{bmatrix} 2 & 1 & -4 \\ 4 & -3 & -4 \\ -8 & -9 & 18 \end{bmatrix}.$$

1. $L = \begin{bmatrix} 1 & 0 & 0 \\ -2 & 1 & 0 \\ 4 & -1 & 1 \end{bmatrix}$

2. $L = \begin{bmatrix} 1 & 0 & 0 \\ 4 & 1 & 0 \\ -8 & -5 & 1 \end{bmatrix}$

3. $L = \begin{bmatrix} 2 & 0 & 0 \\ 2 & -5 & 0 \\ -4 & 1 & -2 \end{bmatrix}$

4. $L = \begin{bmatrix} 2 & 0 & 0 \\ -2 & -5 & 0 \\ 4 & -1 & -2 \end{bmatrix}$

5. $L = \begin{bmatrix} 1 & 0 & 0 \\ 2 & 1 & 0 \\ -4 & 1 & 1 \end{bmatrix}$

6. $L = \begin{bmatrix} 2 & 0 & 0 \\ -4 & -5 & 0 \\ 8 & 5 & -2 \end{bmatrix}$