

Linear Systems and Matrices: math test, College – download the PDF

Suggested time: 45 minutes. Out of 20 points. Calculator allowed only when the problem says so.

1 Gaussian elimination

/ 4 pts

Solve by Gaussian elimination, showing each row operation:

$$2x + y - z = 1, \quad x - y + 2z = 5, \quad 3x + 2y + z = 10.$$

2 Free variable

/ 3 pts

Solve $x + y + 2z = 3$, $2x + 2y + 5z = 8$, $x + y + z = 1$. Take y as the free variable.

3 Matrix operations

/ 3 pts

Let $A = \begin{pmatrix} 1 & -1 \\ 2 & 3 \end{pmatrix}$ and $B = \begin{pmatrix} 0 & 2 \\ -1 & 4 \end{pmatrix}$. Compute $2A - B$, AB , and BA .

4 Inverse and solution

/ 4 pts

Let $A = \begin{pmatrix} 3 & 2 \\ 4 & 3 \end{pmatrix}$. (a) Compute $\det A$ and decide whether A is invertible. (b) Find A^{-1} . (c)

Solve $3x + 2y = 7$, $4x + 3y = 10$.

5 A 3 by 3 determinant

/ 3 pts

Let $A = \begin{pmatrix} 1 & 0 & 2 \\ 3 & 1 & -1 \\ 2 & 4 & 0 \end{pmatrix}$. Compute $\det A$, then $\det(A^T)$ and $\det(2A)$. Is A invertible?

6 LU factorization

/ 3 pts

Let $A = \begin{pmatrix} 1 & 2 & 0 \\ 2 & 5 & 3 \\ 0 & 3 & 5 \end{pmatrix}$. Find L and U , then solve $A\mathbf{x} = (2, 1, -5)$.



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