

Write your name below. This exam is worth 100 points. On each problem, you must show all your work to receive credit on that problem. You may have one page of notes to use on this exam. You are not allowed to collaborate on the exam or seek outside help, nor can you use any other notes, the book, the recorded lectures, a calculator, any computational software, or material you find online.

Name: _____

1. (28 points: 7 each) If the statement is **always true**

(c) If $\det(A) = 0$, then $A\mathbf{x} = \mathbf{b}$ has no solutions.

(d) If W is the set of $n \times n$ matrices, A , such that $\det(A) = 0$, then W a subspace of $\mathbb{R}^{n \times n}$, the vector space of all $n \times n$ matrices.

2. (16 points) Consider $A = \begin{matrix} & \begin{matrix} 2 & 1 & 1 & 2 & 1 & 3 \\ 6 & 2 & 1 & 2 & 1 & 7 \\ 4 & 1 & 2 & 4 & 3 & 5 \end{matrix} \end{matrix}$. A is row equivalent to $\begin{matrix} & \begin{matrix} 2 & 1 & 0 & 0 & 0 & 3 \\ 6 & 0 & 1 & 2 & 0 & 7 \\ 4 & 0 & 0 & 0 & 1 & 5 \\ & 0 & 0 & 0 & 0 & 0 \end{matrix} \end{matrix}$ and

A^T is row equivalent to $\begin{matrix} \begin{matrix} 2 & 6 & 4 \\ 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 2 & 4 \\ 0 & 1 & 1 \\ 0 & 3 & 5 \end{matrix} & \begin{matrix} 1 & 2 & 3 \\ 0 & 1 & 2 \\ 0 & 0 & 1 \\ 0 & 0 & 0 \end{matrix} \end{matrix}$

3. Consider the matrix $A = \begin{bmatrix} 2 & 1 & 2 & 3 \\ 4 & 3 & 5 & 5^5 \\ 2 & 1 & 2 & \end{bmatrix}$.

(a) (14 points) Use Gauss-Jordan Elimination to find the inverse of \mathbf{A} .

(b) (6 points) Use your answer from (a) to find the solutions.

5. Let $A = \begin{pmatrix} 2 & 0 & 4 \\ 1 & 2 & 3 \\ 0 & 1 & 7 \end{pmatrix}$.

(a) (15 points) Determine the permuted LU-factorization of A .

(b) (6 points) Use the answer from (a) to find the determinant of A . (Other methods will receive no credit here.)