MAT 250 Homework 1
Spring 2026

Due date: Monday, January 12

Note: you may use a symbolic math package such as PARI or SAGE, or a calculator that does linear algebra, to work on these problems. But the work that you turn in should show all your your steps. Be sure to check ALL your work. This is simple to do with such a package. Wrong answers will receive zero. Another important point is to read the instructions (next paragraph) carefully and make sure that you answer each question completely.

For each of the following matrices, work through all the steps of the Gaussian Elimination algorithm to convert the matrix to reduced row-echelon form. For each row operation: state the row operation, write down the elementary matrix that implements it, write the determinant of this row operation, and write the new form of the matrix after applying this operation. Finally, write the reduced row-echelon form, and state the rank of the original matrix.

1. $\begin{pmatrix} 2 & 0 & -1 \\ 1 & 1 & 2 \\ 0 & 1 & 1 \end{pmatrix}$

2. $\begin{pmatrix} 1 & 2 & 0 \\ 2 & -1 & 1 \\ 3 & 1 & 1 \end{pmatrix}$

3. $\begin{pmatrix} 1 & -1 & 2 \\ 2 & -2 & 4 \\ -1 & 1 & -2 \end{pmatrix}$