

Gaussian elimination

Idea: Start in the left upper corner and work to the bottom right, using elementary operations.

Algorithm (see also p. 15 of the textbook):

1. Start with the first row and first column element.
2. If the entry in this column and row is
 - a) non-zero, use it to clear the other entries from the column.
 - b) zero, swap the row with a row below, whose element in this column is non-zero. Proceed with a).If neither a) nor b) are applicable, nothing is to do.
3. Mark the column as “done”. If the column was
 - a) all zero beginning with the row working in, move to the next column, but keep the same row.
 - b) not all zero, move to the next column and next row.
4. Repeat steps 2. and 3. until you reach the right hand edge or the bottom of the matrix

Gaussian elimination II

If we want **reduced echelon form**, we insert two more steps

5. When clearing a column, clear also the entries above
6. Rescale the rows such that the leading term becomes 1 (when it is non-zero)

(can be carried out after achieving echelon form or during algorithm)

Nearly every computer algebra package includes an implementation of the Gaussian elimination.