1 Elimination

The Elimination algorithm is used mainly for solving the equation $A \cdot x = b$ where A is a matrix and b is a vector. The algorithm can be summarized as follows: We denote the diagonal values by **pivots**

1. consider the first pivot. Subtract the first row from all the lower rows in such a way that the first column consists only of zeros and a non-zero value in the pivot position. This is equivalent to multiplying the matrix by a number of elimination matrices.

2. multiply the row by the inverse of the pivot value. This is equivalent to multiplying the matrix with a diagonal matrix

3. Assuming the algorithm led to a 0 in a pivot position. There are two possibilities:

   (a) if there is no non-zero value in any of the lower rows, then the elimination is broken permanently.

   (b) if there at least one non-zero value in some lower row, then the elimination is only temporarily broken. The two rows are swapped and the algorithm goes on

4. repeat the steps 1, 3.2 and 2 until obtaining an upper-triangular matrix with 1's throughout the diagonal.

2 Elimination extended

The same underlying principle can be used to reduce the matrix to an identity matrix by subtracting the lower rows from the upper ones.