

# Numerical Calculation HW3

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## 1 Gaussian elimination method

Matlab implementation of this algorithm is attached. Gaussian elimination, also known as row reduction, is an algorithm in linear algebra for solving a system of linear equations. It is usually understood as a sequence of operations performed on the corresponding matrix of coefficients. To perform row reduction on a matrix, one uses a sequence of elementary row operations to modify the matrix until the lower left-hand corner of the matrix is filled with zeros, as much as possible. There are three types of elementary row operations:

- Swapping two rows
- Multiplying a row by a nonzero number
- Adding a multiple of one row to another row

$$\left[ \begin{array}{ccc|c} 1 & 3 & 1 & 9 \\ 1 & 1 & -1 & 1 \\ 3 & 11 & 5 & 35 \end{array} \right] \rightarrow \left[ \begin{array}{ccc|c} 1 & 3 & 1 & 9 \\ 0 & -2 & -2 & -8 \\ 0 & 2 & 2 & 8 \end{array} \right] \rightarrow \left[ \begin{array}{ccc|c} 1 & 3 & 1 & 9 \\ 0 & -2 & -2 & -8 \\ 0 & 0 & 0 & 0 \end{array} \right] \rightarrow \left[ \begin{array}{ccc|c} 1 & 0 & -2 & -3 \\ 0 & 1 & 1 & 4 \\ 0 & 0 & 0 & 0 \end{array} \right] \quad (1)$$

The program takes a number **n** as the number of variables, then it takes **n** functions and **n** variable names.

**Input :**

$$n = 3 \quad (2)$$

$$f(x) = -3z + 1y = -6 \quad (3)$$

$$f(x) = 2z + 1y - 2a = 3 \quad (4)$$

$$f(x) = 1z + 2y - 1a = 3 \quad (5)$$

$$z, y, a \quad (6)$$

**Output :**

$$[7.3, 1, 4.3] \quad (7)$$