

Gauss Jordan



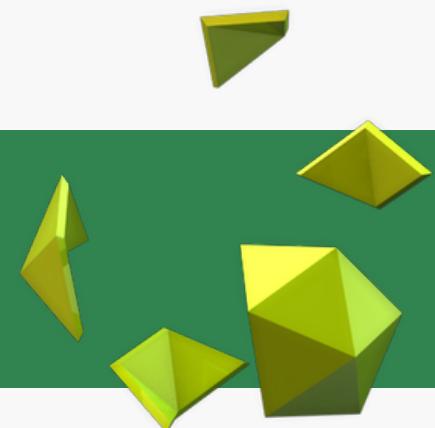


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Background

Carl Friedrich Gauss is a German mathematician who has the nickname '**Prince of Mathematics**'. He was the person who discovered the Gauss elimination which was later developed and perfected by Camille Jordan, a French mathematician, into the Gauss-Jordan elimination.



USAGE

- 1. Gauss elimination application in gold investment information system.**
- 2. The application of Jordan Gauss elimination for traffic light calculations.**
- 3. The application of the Jordan Gauss elimination for the calculation of the electric current strength of each electric circuit.**



WHAT IS

Gauss-Jordan elimination is a procedure for solving systems of linear equations by converting them into reduced row echelon matrix form with elementary row operations. Gauss Jordan elimination will change a matrix into a diagonal matrix, more specifically Gauss Jordan elimination will change the matrix into a singular matrix (unit matrix)

WHAT IS

Eliminasi Gauss

$$\begin{bmatrix} a & b & c \\ d & e & f \\ g & h & i \end{bmatrix} \quad \begin{bmatrix} 1 & ? & ? \\ 0 & 1 & ? \\ 0 & 0 & 1 \end{bmatrix} \quad \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

Eliminasi Gauss Jordan

Picture of the difference
between Gauss and Gauss Jordan

what is a reduced row echelon matrix?

The reduced row echelon matrix is a simplified form of the row echelon matrix which aims to make it easier to solve the solution of a system of equations

Reduced Row Echelon Matrix R

$$A = \left[\begin{array}{ccccccc} 1 & 0 & * & * & 0 & * & 0 \\ 0 & 1 & * & * & 0 & * & 0 \\ 0 & 0 & 0 & 0 & 1 & * & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 1 \end{array} \right]$$

↑ ↑ ↑

Free variables

Properties of reduced row echelon matrix

- 1. If it contains non-zero rows, the leftmost non-zero entry is 1, then this element (number 1) can be referred to as the pivot element.**
- 2. For two consecutive rows where all elements do not consist of zeros, the pivot in the lower row is placed farther to the right than the main pivot in the higher row**
- 3. If it contains zero rows then they are all located at the bottom of the matrix**
- 4. This 4th property is a special property, that is, every column containing 1 main must have a zero element elsewhere.**

Reduced Row Echelon Matrix R

$$A = \left[\begin{array}{cccccc|ccc} 1 & 0 & * & * & 0 & * & 0 \\ 0 & 1 & * & * & 0 & * & 0 \\ 0 & 0 & 0 & 1 & * & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{array} \right]$$

Free variables

1 2 3

4

The matrix is in Reduced Row Echelon Form (RREF). It has 4 pivot elements highlighted: the first column has a 1 at row 1, the second column has a 1 at row 2, the third column has a 1 at row 3, and the fifth column has a 1 at row 4. The fourth column has a 1 at row 5. The first four columns are labeled as pivot columns, while the last three columns are labeled as free variables.

How do we do the elimination of Gauss Jordan?

$$\mathbf{x + 3y + 2z = 14}$$

$$\mathbf{2x + 5y + 0 = 15}$$

$$\mathbf{2x + 7y + z = 13}$$

Example

1	3	2	14
2	5	0	15
2	7	1	13

Example 1

1	3	2	14
2	5	0	15
2	7	1	13

R2-2*R1

R3-2*R1

1	3	2	14
0	-1	-4	-13
0	1	-3	-15

1	3	2	14
0	-1	-4	-13
0	1	-3	-15

R1-(3*R2)

-R2

R3+R2

1	0	-10	-25
0	1	4	13
0	0	-7	-28

1	0	-10	-25
0	1	4	13
0	0	-7	-28

$$-\frac{R3}{7}$$

1	0	-10	-25
0	1	4	13
0	0	1	4

Example 1

1	0	-10	-25
0	1	4	13
0	0	1	4

R1-R2

R2-4*R3

1	0	0	15
0	1	0	-3
0	0	1	4

1	0	0	15
0	1	0	-3
0	0	1	4

So the result of this equation :

$$\mathbf{x = 15}$$

$$\mathbf{y = -3}$$

$$\mathbf{z = 4}$$



Thank You