

DOKUMENTASI TUGAS PROGRAM

METODE NUMERIK 1

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GAUSS SEIDEL

Contoh soal 1:

$$\begin{bmatrix} 4 & -1 & 1 \\ -1 & 4 & -2 \\ 1 & -2 & 4 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} 12 \\ -1 \\ 5 \end{bmatrix}$$

Solusi dari soal di atas:

$$x_1 = 3, x_2 = x_3 = 1$$

Langkah 1: Input banyaknya variable pada soal

```
Number of variable (min 1 max 10) : 3
```

Langkah 2: Input koefisien pada persamaan yang bersesuaian

```
Equation-1
```

$$4 y_1 + -1 y_2 + 1 y_3 = 12$$

```
Equation-2
```

$$-1 y_1 + 4 y_2 + -2 y_3 = -1$$

```
Equation-3
```

$$1 y_1 + -2 y_2 + 4 y_3 = 5$$

Langkah 3: Apabila ada persamaan yang ingin diubah, maka input 'y'. Sebaliknya, apabila tidak ada persamaan yang ingin diubah maka input 'n'.

```
Equation-1
    4 y1 + -1 y2 + 1 y3 = 12

Equation-2
   -1 y1 + 4 y2 + -2 y3 = -1

Equation-3
    1 y1 + -2 y2 + 4 y3 = 5

Insert again ? (y/n) n
```

Langkah 4: Program akan mencetak hasil iterasi dan solusinya

```
Iteration-1 3.00 -0.25 1.25
Iteration-2 2.63 1.13 0.38
Iteration-3 3.19 0.59 1.16
Iteration-4 2.86 1.13 0.75
Iteration-5 3.09 0.84 1.10
Iteration-6 2.94 1.07 0.90
Iteration-7 3.04 0.93 1.05
Iteration-8 2.97 1.04 0.96
Iteration-9 3.02 0.97 1.03
Iteration-10 2.99 1.02 0.98
Iteration-11 3.01 0.99 1.01
Iteration-12 2.99 1.01 0.99
Iteration-13 3.00 0.99 1.01
Iteration-14 3.00 1.00 1.00
Iteration-15 3.00 1.00 1.00
Iteration-16 3.00 1.00 1.00
Iteration-17 3.00 1.00 1.00
Iteration-18 3.00 1.00 1.00
Iteration-19 3.00 1.00 1.00
Iteration-20 3.00 1.00 1.00
Iteration-21 3.00 1.00 1.00
Iteration-22 3.00 1.00 1.00
Iteration-23 3.00 1.00 1.00
Iteration-24 3.00 1.00 1.00
Iteration-25 3.00 1.00 1.00
Iteration-26 3.00 1.00 1.00
Iteration-27 3.00 1.00 1.00
Iteration-28 3.00 1.00 1.00
Iteration-29 3.00 1.00 1.00
Iteration-30 3.00 1.00 1.00
Iteration-31 3.00 1.00 1.00
Iteration-32 3.00 1.00 1.00
Iteration-33 3.00 1.00 1.00
Iteration-34 3.00 1.00 1.00
Iteration-35 3.00 1.00 1.00
Iteration-36 3.00 1.00 1.00
Iteration-37 3.00 1.00 1.00
Iteration-38 3.00 1.00 1.00
Iteration-39 3.00 1.00 1.00
Iteration-40 3.00 1.00 1.00
Iteration-41 3.00 1.00 1.00
Iteration-42 3.00 1.00 1.00
Iteration-43 3.00 1.00 1.00
```

The solution :

```
y1 = 3.00
y2 = 1.00
y3 = 1.00
```

Contoh soal 2:

$$\begin{bmatrix} -2 & 5 & 9 \\ 7 & 1 & 1 \\ -3 & 7 & -1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} 1 \\ 6 \\ -26 \end{bmatrix}$$

Langkah 1 sampai dengan **Langkah 3** sama seperti contoh soal 1 di atas.

```
Equation-1
-2 y1 + 5 y2 + 9 y3 = 1

Equation-2
7 y1 + 1 y2 + 1 y3 = 6

Equation-3
-3 y1 + 7 y2 + -1 y3 = -26

Insert again ? (y/n) n
```

Langkah 4: Program akan meminta kembali inputan dari user, apabila matrix dari persamaan tidak dominan secara diagonal (not diagonally dominant)

```
Equation-1
-2 y1 + 5 y2 + 9 y3 = 1

Equation-2
7 y1 + 1 y2 + 1 y3 = 6

Equation-3
-3 y1 + 7 y2 + -1 y3 = -26

Insert again ? (y/n) n
Not Diagonally Dominant!!!
Input again!!
```

GAUSS JORDAN

Contoh soal:

$$\begin{array}{rcl} x + y + z & = & 4 \\ x - y - z & = & -2 \\ 2x + 8y + z & = & 19 \end{array}$$

Solusi dari soal di atas:

$$x = 1, y = 2, z = 1$$

Langkah 1: Input banyaknya variable pada soal

```
How many variable(s) [2~10]: 3
```

Langkah 2: Input koefisien pada persamaan yang bersesuaian

```
=====
EQUATION #1
=====
Coef. of x1: 1
Coef. of x2: 1
Coef. of x3: 1
RHS Value: 4
=====
EQUATION #2
=====
Coef. of x1: 1
Coef. of x2: -1
Coef. of x3: -1
RHS Value: -2
=====
EQUATION #3
=====
Coef. of x1: 2
Coef. of x2: 8
Coef. of x3: 1
RHS Value: 19
```

Langkah 3: Program akan mencetak solusi dari soal

```
=====
SOLUTION
=====
Solution for x1 is 1.00
Solution for x2 is 2.00
Solution for x3 is 1.00
```

LU DECOMPOSITION

Contoh soal:

$$A = \begin{bmatrix} 1 & 4 & 1 \\ 1 & 6 & -1 \\ 2 & -1 & 2 \end{bmatrix} \quad \mathbf{b} = \begin{bmatrix} 7 \\ 13 \\ 5 \end{bmatrix}$$

Solusi dari soal di atas:

$$x_1 = 5, x_2 = 1, x_3 = -2$$

$$\mathbf{L} = \begin{bmatrix} 1 & 0 & 0 \\ 1 & 1 & 0 \\ 2 & -4.5 & 1 \end{bmatrix} \quad \mathbf{U} = \begin{bmatrix} 1 & 4 & 1 \\ 0 & 2 & -2 \\ 0 & 0 & -9 \end{bmatrix}$$

Langkah 1: Input banyaknya variable pada soal

```
How many variable(s) [2~10]: 3
```

Langkah 2: Input koefisien pada persamaan yang bersesuaian

```
=====
EQUATION #1
=====
Coef. of x1: 1
Coef. of x2: 4
Coef. of x3: 1
RHS Value: 7

=====
EQUATION #2
=====
Coef. of x1: 1
Coef. of x2: 6
Coef. of x3: -1
RHS Value: 13

=====
EQUATION #3
=====
Coef. of x1: 2
Coef. of x2: -1
Coef. of x3: 2
RHS Value: 5
```

Langkah 3: Program akan mencetak solusi dan matrix hasil dekomposisinya dari soal

```
=====
SOLUTION
=====
Solution for x1 is 5.00
Solution for x2 is 1.00
Solution for x3 is -2.00

=====
MATRIX L
=====
    1.00    0.00    0.00
    1.00    1.00    0.00
    2.00   -4.50    1.00

=====
MATRIX U
=====
    1.00    4.00    1.00
    0.00    2.00   -2.00
    0.00    0.00   -9.00
```