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Tugas 2 Praktikum Aljabar Linear Pertemuan

Selesaikan Sistem Persamaan Linear berikut menggunakan metode Dekomposisi LU!!

- $2x_1 + 6x_2 + 2x_3 = 2$
 $-3x_1 - 8x_2 = 2$
 $4x_1 + 9x_2 + 2x_3 = 3$

Penyelesaian :

- Mencari matriks U

Input :

```
1  % 2x1 + 6x2 + 2x3 = 2
2  % -3x1 - 8x2 = 2
3  % 4x1 + 9x2 + 2x3 = 3
4  A = [2 6 2; -3 -8 0; 4 9 2]
5  B = [2; 2; 3]
6
7  % mencari matriks U, dimana matriks memiliki diagonal 1
8  % dan memiliki matriks segitiga bawah
9  A(1,:) = A(1, :)*(1/2)      %B1*(1/2)
10 A(2,:) = A(2, :)+3*A(1, :)  %B2+3B1
11 A(3,:) = A(3, :)-4*A(1, :)  %B3+-4B1
12 A(3,:) = A(3, :)+3*A(2, :)  %B3+3B2
13 A(3,:) = A(3, :)*(1/7)      %B3*(1/7)
14
15 U = A
16
```

Output :

```

Command Window
>> Tugas_2

A =

     2     6     2
    -3    -8     0
     4     9     2

B =

     2
     2
     3

A =

     1     3     1
    -3    -8     0
     4     9     2

A =

     1     3     1
     0     1     3
     0     0     7

A =

     1     3     1
     0     1     3
     0     0     1

U =

     1     3     1
     0     1     3
     0     0     1

```

- Mencari matriks L

Input :

```

17 % mencari matriks L, dimana matriks menjadi segitiga atas
18 % dan untuk memperoleh matriks ini kita cukup melihat hasil
19 % pengali dari eliminasi Gauss dan menginversnya
20 A(1,:) = A(1,:)*(1/2)      %B1*(1/2)
21 E1 = [1/2 0 0; 0 1 0; 0 0 1]
22 E1_inv = inv(E1)
23 A(2,:) = A(2,:)+3*A(1,:)  %B2+3B1
24 E2 = [1 0 0; 3 1 0; 0 0 1]
25 E2_inv = inv(E2)
26 A(3,:) = A(3,:)-4*A(1,:) %B3+-4B1
27 E3 = [1 0 0; 0 1 0; -4 0 1]
28 E3_inv = inv(E3)
29 A(3,:) = A(3,:)+3*A(2,:)  %B3+3B2
30 E4 = [1 0 0; 0 1 0; 0 3 1]
31 E4_inv = inv(E4)
32 A(3,:) = A(3,:)*(1/7)    %B3*(1/7)
33 E5 = [1 0 0; 0 1 0; 0 0 1/7]
34 E5_inv = inv(E5)
35
36 L = [E1_inv*E2_inv*E3_inv*E4_inv*E5_inv]
37

```

Output :

```

A =
    0.5000    1.5000    0.5000
    1.5000    5.5000    4.5000
   -2.0000   -6.0000   -1.0000

E3 =
     1     0     0
     0     1     0
    -4     0     1

E3_inv =
     1     0     0
     0     1     0
     4     0     1

A =
    0.5000    1.5000    0.5000
    1.5000    5.5000    4.5000
    2.5000   10.5000   12.5000

E4 =
     1     0     0
     0     1     0
     0     3     1

E4_inv =
     1     0     0
     0     1     0
     0    -3     1

A =
    0.5000    1.5000    0.5000
     0     1.0000    3.0000
     0         0     1.0000

E1 =
    0.5000     0     0
     0     1.0000     0
     0         0     1.0000

E1_inv =
     2     0     0
     0     1     0
     0     0     1

A =
    0.5000    1.5000    0.5000
    1.5000    5.5000    4.5000
     0         0     1.0000

E2 =
     1     0     0
     3     1     0
     0     0     1

E2_inv =
     1     0     0
    -3     1     0
     0     0     1

A =
    0.5000    1.5000    0.5000
    1.5000    5.5000    4.5000
    0.3571    1.5000    1.7857

E5 =
    1.0000     0     0
     0     1.0000     0
     0         0    0.1429

E5_inv =
     1     0     0
     0     1     0
     0     0     7

L =
     2     0     0
    -3     1     0
     4    -3     7

```

- Mencari nilai x_1 , x_2 , x_3

Input :

```

37
38 % mencari nilai y1, y2, y3 terlebih dahulu
39 % karena matriks U*vektor kolom X dimisalkan sama dengan vektor kolom Y
40 % Y = [y1; y2; y3]
41 % L*Y = B
42 Y = [L B]
43 Y(1,:) = Y(1,:)*(1/2)      %B1*(1/2)
44 Y(2,:) = Y(2,:)+3*Y(1,:)  %B2+3B1
45 Y(3,:) = Y(3,:)-4*Y(1,:)  %B3-4B1
46 Y(3,:) = Y(3,:)+3*Y(2,:)  %B3+3B2
47 Y(3,:) = Y(3,:)*(1/7)     %B3*(1/7)
48 % maka:
49 Y = [1; 5; 2]
50
51 % mencari nilai x1, x2, x3
52 % X = [x1; x2; x3]
53 % U*X = Y
54 X = [U Y]
55 X(1,:) = X(1,:)-X(3,:)    %B1-B3
56 X(2,:) = X(2,:)-3*X(3,:)  %B2-3*B3
57 X(1,:) = X(1,:)-3*X(2,:)  %B1-3*B2
58 % maka:
59 X = [2; -1; 2]

```

Output :

```
Command Window
Y =
     2     0     0     2
    -3     1     0     2
     4    -3     7     3

Y =
     1     0     0     1
    -3     1     0     2
     4    -3     7     3

Y =
     1     0     0     1
     0     1     0     5
     4    -3     7     3

Y =
     1     0     0     1
     0     1     0     5
     0    -3     7    -1

Y =
     1     0     0     1
     0     1     0     5
     0     0     7    14

Y =
     1     0     0     1
     0     1     0     5
     0     0     1     2
```

```
Y =
     1
     5
     2

X =
     1     3     1     1
     0     1     3     5
     0     0     1     2

X =
     1     3     0    -1
     0     1     3     5
     0     0     1     2

X =
     1     3     0    -1
     0     1     0    -1
     0     0     1     2

X =
     1     0     0     2
     0     1     0    -1
     0     0     1     2

X =
     2
    -1
     2

>> |
```

$$\begin{aligned}
 2. \quad & 3x_1 - 6x_2 - 3x_3 = -3 \\
 & 2x_1 + 6x_3 = -22 \\
 & -4x_1 + 7x_2 + 4x_3 = 3
 \end{aligned}$$

Penyelesaian :

- Mencari matriks U

Input :

```

1 % 3x1 - 6x2 - 3x3 = -3
2 % 2x1 + 6x3 = -22
3 % -4x1 + 7x2 + 4x3 = 3
4 A = [3 -6 -3; 2 0 6; -4 7 4]
5 B = [-3; -22; 3]
6
7 % mencari matriks U, dimana matriks memiliki diagonal 1
8 % dan memiliki matriks segitiga bawah
9 A(1,:) = A(1, :)*(1/3) %B1*(1/3)
10 A(2,:) = A(2, :)-2*A(1, :) %B2-2B1
11 A(2,:) = A(2, :)*(1/4) %B2*(1/4)
12 A(3,:) = A(3, :)+4*A(1, :) %B3+4B1
13 A(3,:) = A(3, :)+A(2, :) %B3+B2
14 A(3,:) = A(3, :)*(1/2) %B3*(1/2)
15
16 U = A

```

Output :

	<pre> A = 1 -2 -1 2 0 6 -4 7 4 A = 1 -2 -1 0 4 8 -4 7 4 A = 1 -2 -1 0 1 2 -4 7 4 A = 1 -2 -1 0 1 2 0 -1 0 </pre>	<pre> A = 1 -2 -1 0 1 2 0 0 2 A = 1 -2 -1 0 1 2 0 0 1 U = 1 -2 -1 0 1 2 0 0 1 </pre>
--	---	--

Command Window

```

>> Tugas_2_no_2

A =
    3    -6    -3
    2     0     6
   -4     7     4

B =
   -3
  -22
    3

```

- Mencari matriks L

Input :

```

18 % mencari matriks L, dimana matriks menjadi segitiga atas
19 % dan untuk memperoleh matriks ini kita cukup melihat hasil
20 % pengali dari eliminasi Gauss dan menginversnya
21 A(1,:) = A(1,:)*(1/3) %B1*(1/3)
22 E1 = [1/3 0 0; 0 1 0; 0 0 1]
23 E1_inv = inv(E1)
24 A(2,:) = A(2,:)-2*A(1,:) %B2-2B1
25 E2 = [1 0 0; -2 1 0; 0 0 1]
26 E2_inv = inv(E2)
27 A(2,:) = A(2,:)*(1/4) %B2*(1/4)
28 E3 = [1 0 0; 0 1/4 0; 0 0 1]
29 E3_inv = inv(E3)
30 A(3,:) = A(3,:)+4*A(1,:) %B3+4B1
31 E4 = [1 0 0; 0 1 0; 4 0 1]
32 E4_inv = inv(E4)
33 A(3,:) = A(3,:)+A(2,:) %B3+B2
34 E5 = [1 0 0; 0 1 0; 0 1 1]
35 E5_inv = inv(E5)
36 A(3,:) = A(3,:)*(1/2) %B3*(1/2)
37 E6 = [1 0 0; 0 1 0; 0 0 1/2]
38 E6_inv = inv(E6)
39
40 L = [E1_inv*E2_inv*E3_inv*E4_inv*E5_inv*E6_inv]

```

Output :

Command Window

```

A =
    0.3333    -0.6667   -0.3333
         0     1.0000     2.0000
         0         0     1.0000

E1 =
    0.3333         0         0
         0     1.0000         0
         0         0     1.0000

E1_inv =
     3     0     0
     0     1     0
     0     0     1

A =
    0.3333   -0.6667   -0.3333
   -0.6667    2.3333    2.6667
         0         0     1.0000

E2 =
     1     0     0
    -2     1     0
     0     0     1

E2_inv =
     1     0     0
     2     1     0
     0     0     1

```

```

A =
    0.3333   -0.6667   -0.3333
   -0.1667    0.5833    0.6667
         0         0     1.0000

E3 =
    1.0000         0         0
         0    0.2500         0
         0         0     1.0000

E3_inv =
     1     0     0
     0     4     0
     0     0     1

A =
    0.3333   -0.6667   -0.3333
   -0.1667    0.5833    0.6667
    1.3333   -2.6667   -0.3333

E4 =
     1     0     0
     0     1     0
     4     0     1

E4_inv =
     1     0     0
     0     1     0
    -4     0     1

```

```

A =
    0.3333   -0.6667   -0.3333
   -0.1667    0.5833    0.6667
    1.1667   -2.0833    0.3333

E5 =
     1     0     0
     0     1     0
     0     1     1

E5_inv =
     1     0     0
     0     1     0
     0    -1     1

A =
    0.3333   -0.6667   -0.3333
   -0.1667    0.5833    0.6667
    0.5833   -1.0417    0.1667

E6 =
    1.0000         0         0
         0     1.0000         0
         0         0    0.5000

E6_inv =
     1     0     0
     0     1     0
     0     0     2

```

L =

$$\begin{bmatrix} 3 & 0 & 0 \\ 2 & 4 & 0 \\ -4 & -1 & 2 \end{bmatrix}$$

- Mencari nilai x_1, x_2, x_3

Input :

```
41
42 % mencari nilai y1, y2, y3 terlebih dahulu
43 % karena matriks U*vektor kolom X dimisalkan sama dengan vektor kolom Y
44 % Y = [y1; y2; y3]
45 % L*Y = B
46 Y = [L B]
47 Y(1,:) = Y(1,:)*(1/3)      %B1*(1/3)
48 Y(2,:) = Y(2,:)-2*Y(1,:)  %B2-2B1
49 Y(2,:) = Y(2,:)*(1/4)      %B2*(1/4)
50 Y(3,:) = Y(3,:)+4*Y(1,:)   %B3+4B1
51 Y(3,:) = Y(3,:)+Y(2,:)     %B3+B2
52 Y(3,:) = Y(3,:)*(1/2)      %B3*(1/2)
53 % maka:
54 Y = [-1; -5; -3]
55
56 % mencari nilai x1, x2, x3
57 % X = [x1; x2; x3]
58 % U*X = Y
59 X = [U Y]
60 X(1,:) = X(1,:)+X(3,:)      %B1+B3
61 X(2,:) = X(2,:)-2*X(3,:)    %B2-2*B3
62 X(1,:) = X(1,:)+2*X(2,:)    %B1+2*B2
63 % maka:
64 X = [-2; 1; -3]
```

Output :

```

Command Window

Y =

     3     0     0    -3
     2     4     0   -22
    -4    -1     2     3

Y =

     1     0     0    -1
     2     4     0   -22
    -4    -1     2     3

Y =

     1     0     0    -1
     0     4     0   -20
    -4    -1     2     3

Y =

     1     0     0    -1
     0     1     0    -5
    -4    -1     2     3

Y =

     1     0     0    -1
     0     1     0    -5
     0    -1     2    -1

Y =

     1     0     0    -1
     0     1     0    -5
     0     0     2    -6

```

```

Command Window

Y =

     1     0     0    -1
     0     1     0    -5
     0     0     1    -3

Y =

    -1
    -5
    -3

X =

     1    -2    -1    -1
     0     1     2    -5
     0     0     1    -3

X =

     1    -2     0    -4
     0     1     2    -5
     0     0     1    -3

X =

     1    -2     0    -4
     0     1     0     1
     0     0     1    -3

X =

     1     0     0    -2
     0     1     0     1
     0     0     1    -3

```

```

X =

    -2
     1
    -3

>>

```