ESCUELA MILITAR DE INGENIERÍA "Mcal. Antonio José de Sucre" Prestigio, Disciplina y Mejores Oportunidades	**PRÁCTICA Nº 6**	**CÓDIGO SAGA** A25984-5	**Calificación**
CARRERA: Ingeniería de sistemas	**ASIGNATURA:** Métodos numéricos	**FECHA DE ENTREGA:** 12/05/2023	
Apellidos y Nombres: Gutiérrez Castro Huáscar Aarón		**C.I:** 9951591LP	
CURSO: 4-A	**DOCENTE:** M. Sc. Ing. Ariel Villca Paye		

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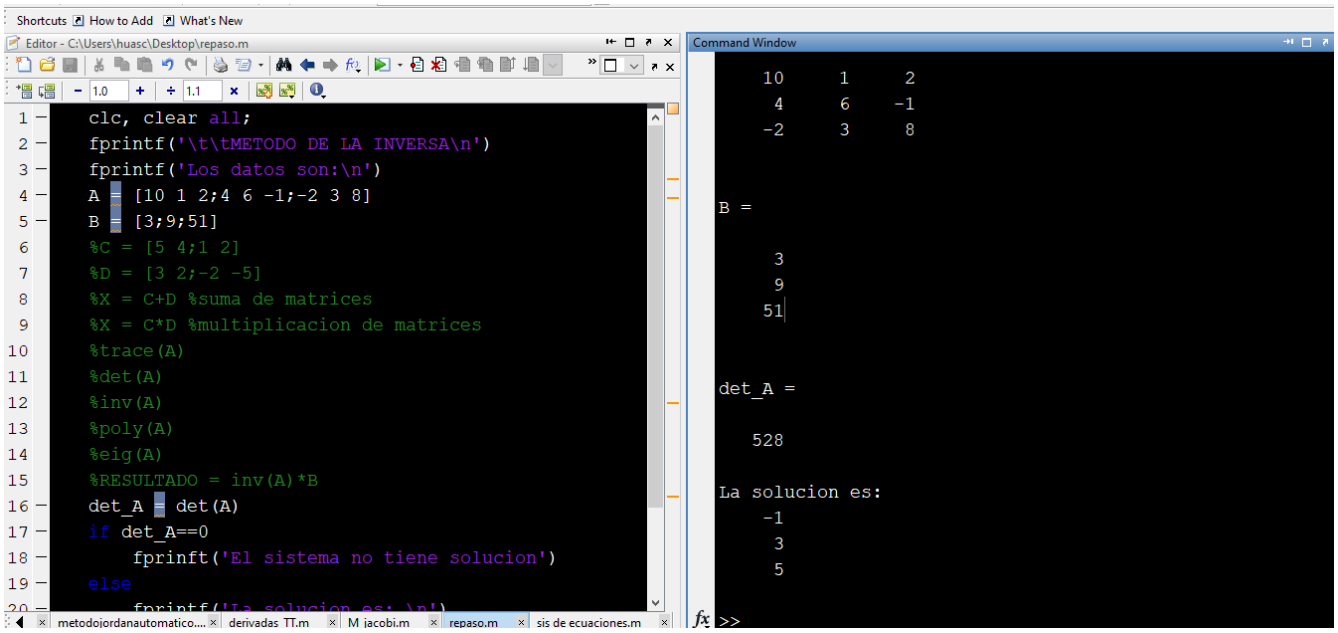
Para cada uno de los problemas, halla la solución del sistema de ecuaciones mediante:

1. Método de la inversa, de forma manual y con MatLab.

Problema 1

$$10x_1 + x_2 + 2x_3 = 3$$
$$4x_1 + 6x_2 - x_3 = 9$$
$$-2x_1 + 3x_2 + 8x_3 = 51$$

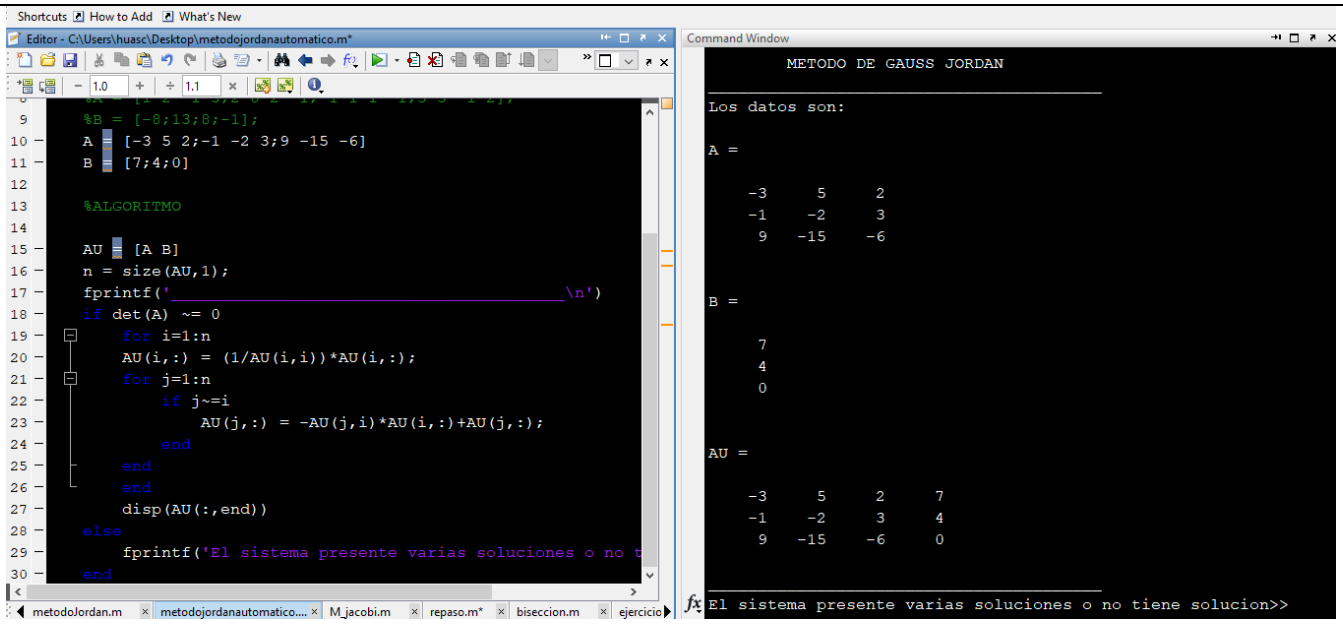


```
        METODO DE LA INVERSA
Los datos son:

A =

    10     1     2
     4     6    -1
    -2     3     8


B =

     3
     9
    51


det_A =

   528

La solucion es:
    -1
     3
     5
```

2. Método de Gauss Jordan, de forma manual y con MatLab.

Problema 2

$$-3x_1 + 5x_2 + 2x_3 = 7$$
$$-x_1 - 2x_2 + 3x_3 = -4$$
$$9x_1 - 15x_2 - 6x_3 = 0$$




```
        METODO DE GAUSS JORDAN
_____________________________________________
Los datos son:

A =

    -3     5     2
    -1    -2     3
     9   -15    -6


B =

     7
     4
     0


AU =

    -3     5     2     7
    -1    -2     3     4
     9   -15    -6     0

_____________________________________________
El sistema presente varias soluciones o no tiene solucion>>
```

3. Método de Jacobi, con un error menor a 0.01, con Excel y MatLab.

Problema 3

$$10x_1 + x_2 + 2x_3 - x_4 = -3$$
$$-5x_1 + 4x_2 + 6x_3 - x_4 = 9$$
$$-2x_2 + 3x_3 + 8x_4 = 2$$
$$-5x_3 + 5x_4 = -1$$

NOTA. No es ni es posible hacerse una matriz diagonalmente dominante para A[2,2], por lo que el proceso puede ser divergente. Por ende, no es recomendable usar métodos iterativos como Jacobi.

```
clc, clear all;
%Metodo jacobi
fprintf('Método de Jacobi para sistemas de ecuaciones\n')
fprintf('_____\n')
fprintf('Datos\n')
A = [10 1 2 -1;-5 4 6 -1;0 0 -5 5;0 -2 3 8]
B = [-3;9;-1;2]
iter_max = 100;
errmax = 0.01;
n=size(A,1);
X = zeros(1,n);
err1 = inf;
err = 0;
iter = 0;
fprintf('e_std = %1.2f\n',errmax)
fprintf('_____\n')
fprintf('iter    x_1      x_2      x_3      x_4     e_a\n')
fprintf('_____\n')
    fprintf('%2.0f %8.4f %8.4f %8.4f %8.4f %8.2f%%\n',ite
while  err1>errmax && iter<iter_max

    X_old = X;
```

32	-0.4686	0.9798	0.5044	0.3043	0.44%
33	-0.4684	0.9838	0.5043	0.3058	0.49%
34	-0.4687	0.9844	0.5058	0.3068	0.33%
35	-0.4689	0.9822	0.5068	0.3064	0.23%
36	-0.4689	0.9802	0.5064	0.3055	0.31%
37	-0.4688	0.9806	0.5055	0.3051	0.19%
38	-0.4686	0.9821	0.5051	0.3056	0.16%
39	-0.4687	0.9829	0.5056	0.3061	0.17%
40	-0.4688	0.9823	0.5061	0.3061	0.10%
41	-0.4688	0.9814	0.5061	0.3058	0.11%
42	-0.4688	0.9812	0.5058	0.3056	0.08%
43	-0.4687	0.9817	0.5056	0.3056	0.05%
44	-0.4687	0.9822	0.5056	0.3058	0.07%
45	-0.4688	0.9821	0.5058	0.3059	0.04%
46	-0.4688	0.9818	0.5059	0.3058	0.04%
47	-0.4688	0.9816	0.5058	0.3057	0.04%
48	-0.4688	0.9817	0.5057	0.3057	0.02%
49	-0.4687	0.9819	0.5057	0.3058	0.03%
50	-0.4688	0.9820	0.5058	0.3058	0.02%
51	-0.4688	0.9818	0.5058	0.3058	0.01%
52	-0.4688	0.9817	0.5058	0.3058	0.02%
53	-0.4688	0.9817	0.5058	0.3058	0.01%

```
Método de Jacobi para sistemas de ecuaciones
_____________________________________________
Datos

A =

    10     1     2    -1
    -5     4     6    -1
     0     0    -5     5
     0    -2     3     8


B =

    -3
     9
    -1
     2

e_std = 0.01
```

iter	x_1	x_2	x_3	x_4	e_a
0	0.0000	0.0000	0.0000	0.0000	Inf%
1	-0.3000	2.2500	0.2000	0.2500	100.00%
2	-0.5400	1.6375	0.4500	0.7375	66.10%
3	-0.4800	1.0844	0.9375	0.4906	52.00%
4	-0.5469	0.3664	0.6906	0.1695	195.95%
5	-0.4578	0.5729	0.3695	0.0826	105.20%
6	-0.4229	1.1441	0.2826	0.2546	67.56%
7	-0.4455	1.3611	0.4546	0.4300	40.79%
8	-0.4840	1.1187	0.6300	0.4198	27.84%
9	-0.4959	0.8048	0.6198	0.2934	43.07%
10	-0.4751	0.7738	0.4934	0.2188	34.10%
11	-0.4542	0.9707	0.4188	0.2584	20.28%
12	-0.4550	1.1187	0.4584	0.3356	23.00%
13	-0.4700	1.0775	0.5356	0.3578	14.41%
14	-0.4791	0.9485	0.5578	0.3185	13.60%
15	-0.4746	0.8941	0.5185	0.2780	14.59%
16	-0.4653	0.9485	0.4780	0.2791	8.49%
17	-0.4625	1.0212	0.4791	0.3079	9.36%
18	-0.4671	1.0302	0.5079	0.3256	5.67%
19	-0.4720	0.9856	0.5256	0.3171	4.52%
20	-0.4720	0.9508	0.5171	0.2993	5.94%
21	-0.4686	0.9592	0.4993	0.2938	3.56%
22	-0.4664	0.9888	0.4938	0.3026	2.99%
23	-0.4674	1.0020	0.5026	0.3120	3.03%

24	-0.4695	0.9899	0.5120	0.3120	1.85%
25	-0.4702	0.9731	0.5120	0.3055	2.15%
26	-0.4692	0.9706	0.5055	0.3013	1.40%
27	-0.4680	0.9806	0.5013	0.3031	1.03%
28	-0.4680	0.9889	0.5031	0.3072	1.33%
29	-0.4688	0.9871	0.5072	0.3086	0.81%
30	-0.4693	0.9804	0.5086	0.3066	0.69%
31	-0.4691	0.9772	0.5066	0.3044	0.72%
32	-0.4686	0.9798	0.5044	0.3043	0.44%
33	-0.4684	0.9838	0.5043	0.3058	0.49%
34	-0.4687	0.9844	0.5058	0.3068	0.33%
35	-0.4689	0.9822	0.5068	0.3064	0.23%
36	-0.4689	0.9802	0.5064	0.3055	0.31%
37	-0.4688	0.9806	0.5055	0.3051	0.19%
38	-0.4686	0.9821	0.5051	0.3056	0.16%
39	-0.4687	0.9829	0.5056	0.3061	0.17%
40	-0.4688	0.9823	0.5061	0.3061	0.10%
41	-0.4688	0.9814	0.5061	0.3058	0.11%
42	-0.4688	0.9812	0.5058	0.3056	0.08%
43	-0.4687	0.9817	0.5056	0.3056	0.05%
44	-0.4687	0.9822	0.5056	0.3058	0.07%
45	-0.4688	0.9821	0.5058	0.3059	0.04%
46	-0.4688	0.9818	0.5059	0.3058	0.04%
47	-0.4688	0.9816	0.5058	0.3057	0.04%
48	-0.4688	0.9817	0.5057	0.3057	0.02%
49	-0.4687	0.9819	0.5057	0.3058	0.03%
50	-0.4688	0.9820	0.5058	0.3058	0.02%
51	-0.4688	0.9818	0.5058	0.3058	0.01%
52	-0.4688	0.9817	0.5058	0.3058	0.02%
53	-0.4688	0.9817	0.5058	0.3058	0.01%

Los rasultados son:
X_1: -0.4688
X_2: 0.9817
X_3: 0.5058
X_4: 0.3058>>

Método de Jacobi

Datos

$$\begin{aligned} 10x_1 &+x_2 &+2x_3 &-x_4 &= -3 \\ -5x_1 &+4x_2 &+6x_3 &-x_4 &= 9 \\ 0x_1 &+0x_2 &-5x_3 &+5x_4 &= -1 \\ 0x_1 &-2x_2 &+3x_3 &+8x_4 &= 2 \end{aligned}$$

x_1=	(-3-1*x_2-2*x_3+x_4)/10	C.S.=	4
x_2=	(9-4*x_1-6*x_3+1*x_4)/-5	e_std=	0.01%
x_3=	(-1-0*x_1-0*x_2-5*x_4)/-5		
x_4=	(2+0*x_1+2*x_2-3*x_3)/8		

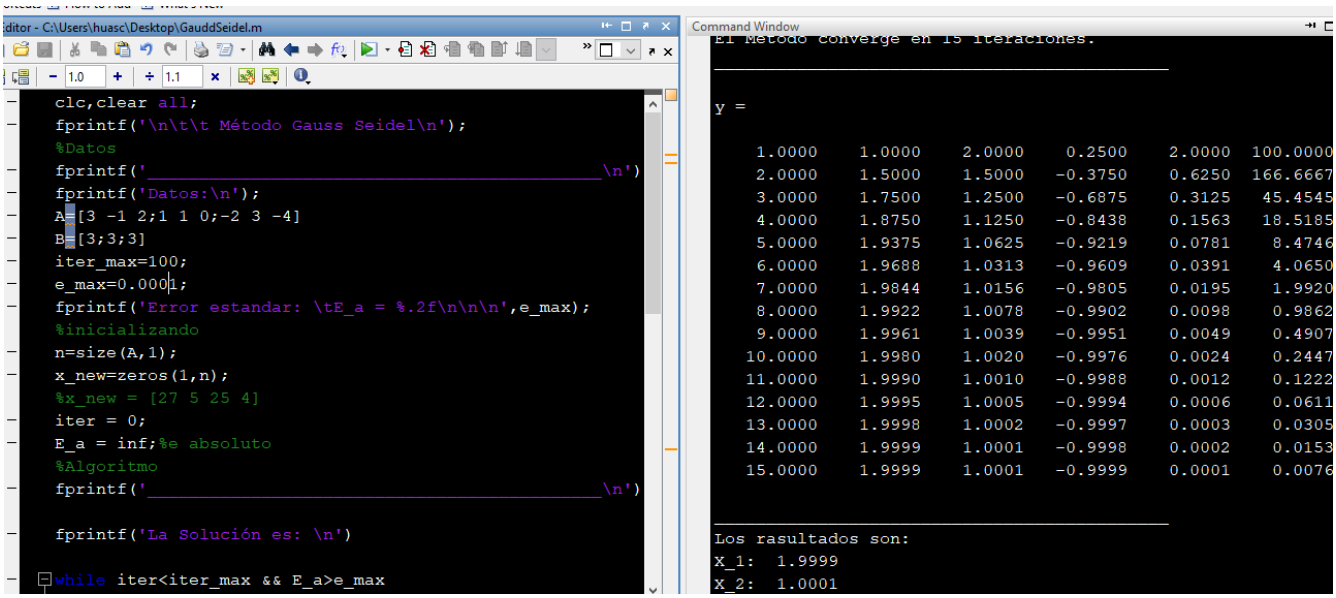
[A] no es estrictamente diagonal dominante por la fila 2, verificada por nosotros

iter	x_1	x_2	x_3	x_4	E_a	E_a<E_std	e_a	e_a<e_std
0	0.0000	0.0000	0.0000	0.0000				
1	-0.3000	2.2500	0.2000	0.2500	2.2500	siga iterando	100.000%	siga iterando
2	-0.5400	1.6375	0.4500	0.7375	0.6610	siga iterando	66.102%	siga iterando
3	-0.4800	1.0844	0.9375	0.4906	0.5200	siga iterando	52.000%	siga iterando
4	-0.5469	0.3664	0.6906	0.1695	1.9595	siga iterando	195.949%	siga iterando
5	-0.4578	0.5729	0.3695	0.0826	1.0520	siga iterando	105.201%	siga iterando
6	-0.4229	1.1441	0.2826	0.2546	0.6756	siga iterando	67.555%	siga iterando
7	-0.4455	1.3611	0.4546	0.4300	0.4079	siga iterando	40.787%	siga iterando
8	-0.4840	1.1187	0.6300	0.4198	0.2784	siga iterando	27.840%	siga iterando
9	-0.4959	0.8048	0.6198	0.2934	0.4307	siga iterando	43.067%	siga iterando
10	-0.4751	0.7738	0.4934	0.2188	0.3410	siga iterando	34.105%	siga iterando
11	-0.4542	0.9707	0.4188	0.2584	0.2028	siga iterando	20.284%	siga iterando
12	-0.4550	1.1187	0.4584	0.3356	0.2300	siga iterando	23.004%	siga iterando
13	-0.4700	1.0775	0.5356	0.3578	0.1441	siga iterando	14.414%	siga iterando
14	-0.4791	0.9485	0.5578	0.3185	0.1360	siga iterando	13.603%	siga iterando
15	-0.4746	0.8941	0.5185	0.2780	0.1459	siga iterando	14.591%	siga iterando
16	-0.4653	0.9485	0.4780	0.2791	0.0849	siga iterando	8.485%	siga iterando
17	-0.4625	1.0212	0.4791	0.3079	0.0936	siga iterando	9.358%	siga iterando
18	-0.4671	1.0302	0.5079	0.3256	0.0567	siga iterando	5.673%	siga iterando
19	-0.4720	0.9856	0.5256	0.3171	0.0452	siga iterando	4.519%	siga iterando
20	-0.4720	0.9508	0.5171	0.2993	0.0594	siga iterando	5.944%	siga iterando
21	-0.4686	0.9592	0.4993	0.2938	0.0356	siga iterando	3.563%	siga iterando
22	-0.4664	0.9888	0.4938	0.3026	0.0299	siga iterando	2.991%	siga iterando
23	-0.4674	1.0020	0.5026	0.3120	0.0303	siga iterando	3.032%	siga iterando
24	-0.4695	0.9899	0.5120	0.3120	0.0185	siga iterando	1.848%	siga iterando
25	-0.4702	0.9731	0.5120	0.3055	0.0215	siga iterando	2.146%	siga iterando
26	-0.4692	0.9706	0.5055	0.3013	0.0140	siga iterando	1.398%	siga iterando
27	-0.4680	0.9806	0.5013	0.3031	0.0103	siga iterando	1.027%	siga iterando
28	-0.4680	0.9889	0.5031	0.3072	0.0133	siga iterando	1.333%	siga iterando
29	-0.4688	0.9871	0.5072	0.3086	0.0081	siga iterando	0.808%	siga iterando
30	-0.4693	0.9804	0.5086	0.3066	0.0069	siga iterando	0.691%	siga iterando
31	-0.4691	0.9772	0.5066	0.3044	0.0072	siga iterando	0.724%	siga iterando
32	-0.4686	0.9798	0.5044	0.3043	0.0044	siga iterando	0.437%	siga iterando
33	-0.4684	0.9838	0.5043	0.3058	0.0049	siga iterando	0.487%	siga iterando
34	-0.4687	0.9844	0.5058	0.3068	0.0033	siga iterando	0.325%	siga iterando
35	-0.4689	0.9822	0.5068	0.3064	0.0023	siga iterando	0.231%	siga iterando
36	-0.4689	0.9802	0.5064	0.3055	0.0031	siga iterando	0.308%	siga iterando
37	-0.4688	0.9806	0.5055	0.3051	0.0019	siga iterando	0.186%	siga iterando
38	-0.4686	0.9821	0.5051	0.3056	0.0016	siga iterando	0.158%	siga iterando
39	-0.4687	0.9829	0.5056	0.3061	0.0017	siga iterando	0.168%	siga iterando
40	-0.4688	0.9823	0.5061	0.3061	0.0010	siga iterando	0.101%	siga iterando
41	-0.4688	0.9814	0.5061	0.3058	0.0011	siga iterando	0.111%	siga iterando
42	-0.4688	0.9812	0.5058	0.3056	0.0008	siga iterando	0.077%	siga iterando
43	-0.4687	0.9817	0.5056	0.3056	0.0005	siga iterando	0.052%	siga iterando
44	-0.4687	0.9822	0.5056	0.3058	0.0007	siga iterando	0.071%	siga iterando
45	-0.4688	0.9821	0.5058	0.3059	0.0004	siga iterando	0.043%	siga iterando
46	-0.4688	0.9818	0.5059	0.3058	0.0004	siga iterando	0.036%	siga iterando
47	-0.4688	0.9816	0.5058	0.3057	0.0004	siga iterando	0.039%	siga iterando
48	-0.4688	0.9817	0.5057	0.3057	0.0002	siga iterando	0.024%	siga iterando
49	-0.4687	0.9819	0.5057	0.3058	0.0003	siga iterando	0.025%	siga iterando
50	-0.4688	0.9820	0.5058	0.3058	0.0002	siga iterando	0.018%	siga iterando
51	-0.4688	0.9818	0.5058	0.3058	0.0001	siga iterando	0.012%	siga iterando
52	-0.4688	0.9817	0.5058	0.3058	0.0002	siga iterando	0.016%	siga iterando
53	-0.4688	0.9817	0.5058	0.3058	0.0001	valor verdadero	0.010%	valor verdadero
54	-0.4688	0.9818	0.5058	0.3058	0.0001	valor verdadero	0.008%	valor verdadero
55	-0.4688	0.9819	0.5058	0.3058	0.0001	valor verdadero	0.009%	valor verdadero

4. Método de Gauss Seidel, con un error menor a 0.01, con Excel y MatLab.

Problema 4

$$x_1 + x_2 = 3$$
$$-2x_1 + 3x_2 - 4x_3 = 3$$
$$3x_1 - x_2 + 2x_3 = 3$$



```
clc,clear all;
fprintf('\n\t\t Método Gauss Seidel\n');
%Datos
fprintf('_____\n')
fprintf('Datos:\n');
A=[3 -1 2;1 1 0;-2 3 -4]
B=[3;3;3]
iter_max=100;
e_max=0.0001;
fprintf('Error estandar: \tE_a = %.2f\n\n\n',e_max);
%inicializando
n=size(A,1);
x_new=zeros(1,n);
%x_new = [27 5 25 4]
iter = 0;
E_a = inf;%e absoluto
%Algoritmo
fprintf('_____\n')

fprintf('La Solución es: \n')

while iter<iter_max && E_a>e_max
```

```
El Método converge en 15 iteraciones.
_____

y =

    1.0000    1.0000    2.0000    0.2500    2.0000  100.0000
    2.0000    1.5000    1.5000   -0.3750    0.6250  166.6667
    3.0000    1.7500    1.2500   -0.6875    0.3125   45.4545
    4.0000    1.8750    1.1250   -0.8438    0.1563   18.5185
    5.0000    1.9375    1.0625   -0.9219    0.0781    8.4746
    6.0000    1.9688    1.0313   -0.9609    0.0391    4.0650
    7.0000    1.9844    1.0156   -0.9805    0.0195    1.9920
    8.0000    1.9922    1.0078   -0.9902    0.0098    0.9862
    9.0000    1.9961    1.0039   -0.9951    0.0049    0.4907
   10.0000    1.9980    1.0020   -0.9976    0.0024    0.2447
   11.0000    1.9990    1.0010   -0.9988    0.0012    0.1222
   12.0000    1.9995    1.0005   -0.9994    0.0006    0.0611
   13.0000    1.9998    1.0002   -0.9997    0.0003    0.0305
   14.0000    1.9999    1.0001   -0.9998    0.0002    0.0153
   15.0000    1.9999    1.0001   -0.9999    0.0001    0.0076

_____
Los rasultados son:
X_1:  1.9999
X_2:  1.0001
```

```
         Método Gauss Seidel
_____________________________________________
Datos:

A =

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


B =

     3
     3
     3

Error estandar:     E_a = 0.00



_____________________________________________
La Solución es:

El Método converge en 15 iteraciones.
_____________________________________________
```

```
y =

    1.0000    1.0000    2.0000    0.2500    2.0000  100.0000
    2.0000    1.5000    1.5000   -0.3750    0.6250  166.6667
    3.0000    1.7500    1.2500   -0.6875    0.3125   45.4545
    4.0000    1.8750    1.1250   -0.8438    0.1563   18.5185
    5.0000    1.9375    1.0625   -0.9219    0.0781    8.4746
    6.0000    1.9688    1.0313   -0.9609    0.0391    4.0650
    7.0000    1.9844    1.0156   -0.9805    0.0195    1.9920
    8.0000    1.9922    1.0078   -0.9902    0.0098    0.9862
    9.0000    1.9961    1.0039   -0.9951    0.0049    0.4907
   10.0000    1.9980    1.0020   -0.9976    0.0024    0.2447
   11.0000    1.9990    1.0010   -0.9988    0.0012    0.1222
   12.0000    1.9995    1.0005   -0.9994    0.0006    0.0611
   13.0000    1.9998    1.0002   -0.9997    0.0003    0.0305
   14.0000    1.9999    1.0001   -0.9998    0.0002    0.0153
   15.0000    1.9999    1.0001   -0.9999    0.0001    0.0076


Los rasultados son:
X_1:  1.9999
X_2:  1.0001
X_3: -0.9999
>>
```

Método de Gauss Eidel

Datos

$$\begin{aligned} 3x_1 \quad -x_2 \quad +2x_3 &= 3 \\ x_1 \quad +x_2 \quad +0x_3 &= 3 \\ -2x_1 \quad +3x_2 \quad -4x_3 &= 3 \end{aligned}$$

x_1= (3+1*x_2-2*x_3)/3

x_2= (3-1*x_1-0*x_3)/1

x_3= (3+2*x_1-3*x_2)/-4

C.S.= 4

e_std= 0.01%

[A] es diagonal dominanate verificada por nosotros

iter	x_1	x_2	x_3	E_a	E_a<E_std	e_a	e_a<e_std
0	0.0000	0.0000	0.0000				
1	1.0000	2.0000	0.2500	2.0000	siga iterando	100.000%	siga iterando
2	1.5000	1.5000	-0.3750	0.6250	siga iterando	166.667%	siga iterando
3	1.7500	1.2500	-0.6875	0.3125	siga iterando	45.455%	siga iterando
4	1.8750	1.1250	-0.8438	0.1563	siga iterando	18.519%	siga iterando
5	1.9375	1.0625	-0.9219	0.0781	siga iterando	8.475%	siga iterando
6	1.9688	1.0313	-0.9609	0.0391	siga iterando	4.065%	siga iterando
7	1.9844	1.0156	-0.9805	0.0195	siga iterando	1.992%	siga iterando
8	1.9922	1.0078	-0.9902	0.0098	siga iterando	0.986%	siga iterando
9	1.9961	1.0039	-0.9951	0.0049	siga iterando	0.491%	siga iterando
10	1.9980	1.0020	-0.9976	0.0024	siga iterando	0.245%	siga iterando
11	1.9990	1.0010	-0.9988	0.0012	siga iterando	0.122%	siga iterando
12	1.9995	1.0005	-0.9994	0.0006	siga iterando	0.061%	siga iterando
13	1.9998	1.0002	-0.9997	0.0003	siga iterando	0.031%	siga iterando
14	1.9999	1.0001	-0.9998	0.0002	siga iterando	0.015%	siga iterando
15	1.9999	1.0001	-0.9999	0.0001	valor verdad	0.008%	valor verdad