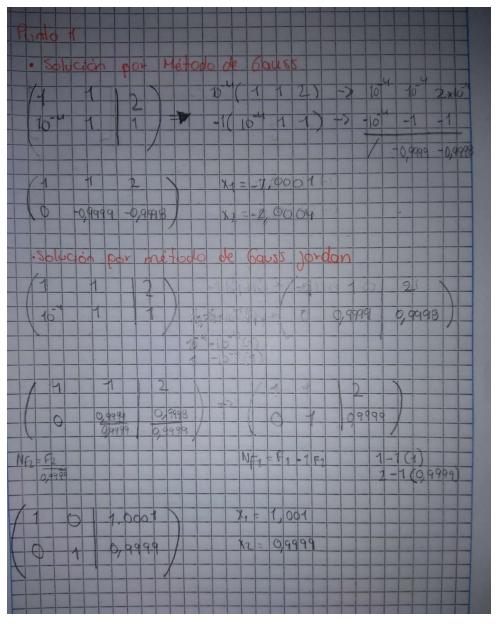
Taller: Ejercicios de Sistemas

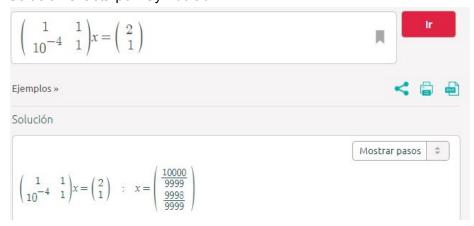
Sandra Chávez

Punto Uno

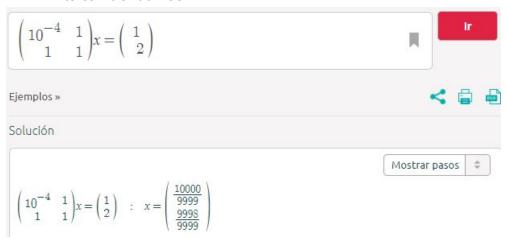
• Solución Manualmente:



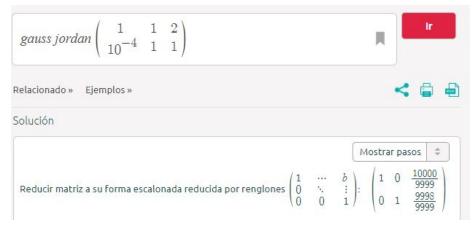
Solución exacta por Symbolab:

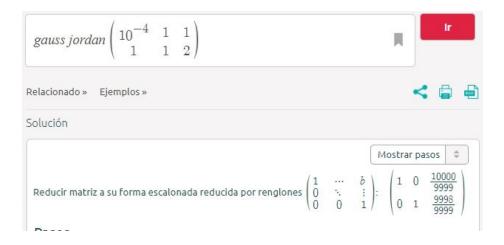


- Solucionar por Gauss
 - o Intercambiando filas:



Solucionar por Gauss Jordan





Resultado algoritmo Gauss Jordan:

```
Matriz aumentada:
[[1.e+00 1.e+00 2.e+00]
 [1.e-04 1.e+00 1.e+00]]
Pivoteo parcial por filas
[[1.e+00 1.e+00 2.e+00]
 [1.e-04 1.e+00 1.e+00]]
eliminacion hacia adelante
[[1.
        1.
                2.
        0.9999 0.9998]]
eliminación hacia atrás
[[1.00000000e+00 1.11022302e-16 1.00010001e+00]
 [0.00000000e+00 1.00000000e+00 9.99899990e-01]]
solución de X:
[[1.00010001]
 [0.99989999]]
Operaciones totales:
PS C:\Users\Sandra Isabel>
```

Punto Dos

Cramer 3x3:

```
resolver A*x = B
[[ 4 -1 5]
  [-1 4 6]
  [-1 7 4]] X = [1 6 3]
Solucion por Cramer
[-1.11111111, -0.31623932, 1.02564103]
Operaciones totales 15
PS C:\Users\Sandra Isabel> [
```

Gauss Jordan 3x3:

```
Matriz aumentada:
[[ 4. -1. 5. 1.]
 [-1. \ 4. \ 6. \ 6.]
 [-1. 7. 4. 3.]]
Pivoteo parcial por filas
[[ 4. -1. 5. 1.]
 [-1. 7. 4. 3.]
 [-1. 4. 6. 6.]]
eliminacion hacia adelante
[[ 4.
             -1.
              6.75
                          5.25
 [ 0.
                                    3.25
 [ 0.
                          4.33333333 4.44444444]]
              0.
eliminación hacia atrás
[[ 1.
              0.
                          0.
                                     -1.11111111]
[ 0.
              1.
                          0.
                                     -0.31623932]
              0.
                          1.
                                     1.02564103]]
solución de X:
[[-1.11111111]]
 [-0.31623932]
 [ 1.02564103]]
Operaciones totales:
PS C:\Users\Sandra Isabel>
```

Gauss Jordan 5x5:

```
Matriz aumentada:

[[1. 1. 3. 3. 3. 2.]
[1. 1. 3. 3. 3. 2.]
[1. 1. 3. 3. 3. 4.]
[1. 1. 3. 3. 3. 2.]
Pivoteo parcial por filas

[[1. 1. 3. 3. 3. 2.]
[1. 1. 3. 3. 3. 2.]
[1. 1. 3. 3. 3. 2.]
[1. 1. 3. 3. 3. 2.]
[1. 1. 3. 3. 3. 2.]

[1. 1. 3. 3. 3. 2.]
PS C:\Users\Sandra Isabel>
```

Cramer 5x5:

```
resolver A*x = B

[[1 1 3 3 3]

[1 1 3 3 3]

[1 1 3 3 3]

[1 1 3 3 3]] X = [2 2 4 2 2]

Solucion por Cramer

c:/Users/Sandra Isabel/Desktop/Nu
R.append(round(np.linalg.det(ma
[nan, nan, nan, nan]

Operaciones totales 45

PS C:\Users\Sandra Isabel>
[]
```

Gauss Jordan 10x10:

```
Matriz aumentada:
[[1, 1, 3, 3, 3, 3, 3, 3, 3, 3, 2,]
 [1. 1. 3. 3. 3. 3. 3. 3. 3. 3. 2.]
 [1. 1. 3. 3. 3. 3. 3. 3. 3. 3. 4.]
 [1, 1, 3, 3, 3, 3, 3, 3, 3, 3, 2,]
 [1, 1, 3, 3, 3, 3, 3, 3, 3, 3, 2, ]
 [1. 1. 3. 3. 3. 3. 3. 3. 3. 3. 2.]
 [1. 1. 3. 3. 3. 3. 3. 3. 3. 6.]
 [1. 1. 3. 3. 3. 3. 3. 3. 3. 3. 2.]
 [1. 1. 3. 3. 3. 3. 3. 3. 3. 3. 2.]
 [1. 1. 3. 3. 3. 3. 3. 3. 3. 3. 1.]]
Pivoteo parcial por filas
[[1, 1, 3, 3, 3, 3, 3, 3, 3, 3, 2,]
 [1. 1. 3. 3. 3. 3. 3. 3. 3. 3. 2.]
 [1. 1. 3. 3. 3. 3. 3. 3. 3. 4.]
 [1, 1, 3, 3, 3, 3, 3, 3, 3, 2,]
 [1. 1. 3. 3. 3. 3. 3. 3. 3. 3. 2.]
 [1, 1, 3, 3, 3, 3, 3, 3, 3, 3, 2,]
 [1. 1. 3. 3. 3. 3. 3. 3. 3. 6.]
 [1, 1, 3, 3, 3, 3, 3, 3, 3, 3, 2,]
 [1. 1. 3. 3. 3. 3. 3. 3. 3. 3. 2.]
 [1, 1, 3, 3, 3, 3, 3, 3, 3, 1,]]
```

```
Operaciones totales:
118
PS C:\Users\Sandra Isabel> S
```

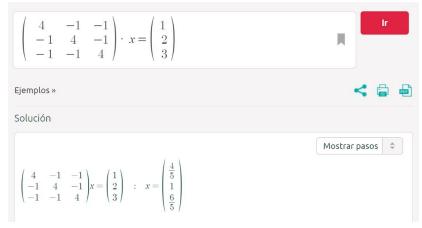
Cramer 10x10:

```
resolver A*x = B
[[1 1 3 3 3 3 3 3 3 3 3]
    [1 1 3 3 3 3 3 3 3 3]
    [1 1 3 3 3 3 3 3 3 3]
    [1 1 3 3 3 3 3 3 3 3]
    [1 1 3 3 3 3 3 3 3 3]
    [1 1 3 3 3 3 3 3 3 3]
    [1 1 3 3 3 3 3 3 3 3]
    [1 1 3 3 3 3 3 3 3 3]
    [1 1 3 3 3 3 3 3 3 3]
    [1 1 3 3 3 3 3 3 3 3]
    [1 1 3 3 3 3 3 3 3 3]
    [1 1 a a belief length of the second of t
```

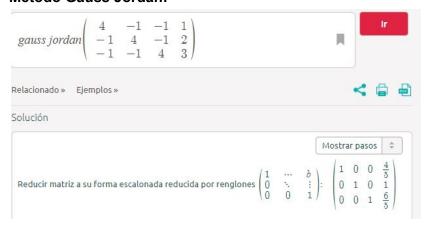
Punto tres

Demostración Symbolab:

Método Gauss:



Método Gauss Jordan:

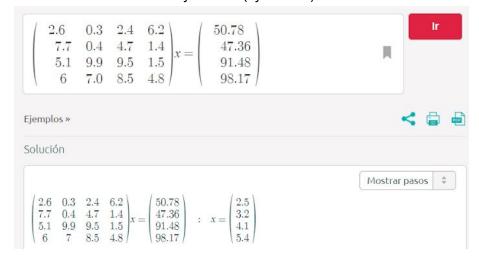


Solución algoritmo Gauss Jordan:

```
Matriz aumentada:
[[ 4. -1. -1. 1.]
 [-1. 4. -1. 2.]
[-1. -1. 4. 3.]]
Pivoteo parcial por filas
[[ 4. -1. -1. 1.]
[-1. 4. -1. 2.]
[-1. -1. 4. 3.]]
eliminacion hacia adelante
[[ 4.
              -1.
  0.
               3.75
                                        2.25
                          -1.25
  0.
               0.
                           3.33333333 4.
eliminación hacia atrás
[[1. 0. 0. 0.8]
[0. 1. 0. 1.]
[0. 0. 1. 1.2]]
solución de X:
[[0.8]
[1. ]
[1.2]]
Operaciones totales:
13
PS C:\Users\Sandra Isabel>
```

Punto Cuatro

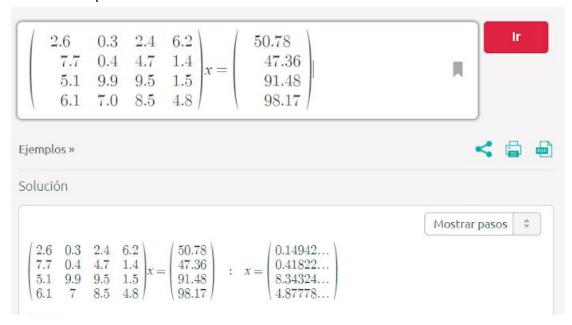
Resolver de forma exacta y directa (symbolab)



Solución algoritmo Gauss Jordan:

```
2.6
        0.3
               2.4
                      6.2 50.78]
             4.7
9.5
        0.4
  7.7
                     1.4 47.36]
       9.9
7.
                   1.5 91.48
4.8 98.17]]
               8.5
 6.
Pivoteo parcial por filas
[[ 7.7 0.4 4.7 1.4 47.36]
[ 5.1 9.9 9.5 1.5 91.48]
[ 6. 7. 8.5 4.8 98.17]
[ 2.6 0.3 2.4 6.2 50.78]]
eliminacion hacia adelante
[[ 7.70000000e+00 4.00000000e-01 4.70000000e+00 1.40000000e+00
 6.01116883e+01]
 [ 0.000000000e+00 0.00000000e+00 4.04030193e-01 3.31152446e+00
  1.95387559e+01]
 [ 0.00000000e+00 0.00000000e+00 0.00000000e+00 -4.98315263e-02
  -2.69090242e-01]]
eliminación hacia atrás
[[ 1.00000000e+00 0.00000000e+00 0.00000000e+00 6.33058613e-16
   2.500000000e+00]
 [ 0.00000000e+00 1.00000000e+00 0.00000000e+00 7.28617426e-16
   3.200000000e+00]
 [ 0.00000000e+00 0.00000000e+00 1.00000000e+00 -1.09914857e-15
   4.100000000e+00]
 [-0.00000000e+00<sup>-</sup>-0.00000000e+00 -0.00000000e+00 1.00000000e+00
  5.40000000e+00]]
solución de X:
[[2.5]
[3.2]
[4.1]
[5.4]]
Operaciones totales:
PS C:\Users\Sandra Isabel>
```

• Cambiar $a_{41} = 6 \ por \ a_{41} = 6.1$ ¿Qué efecto tiene esto en la solución, en % cómo cambió la solución? encontrar ese porcentaje de cambio sin tener que volver a solucionar el problema.



Solución algoritmo Gauss Jordan:

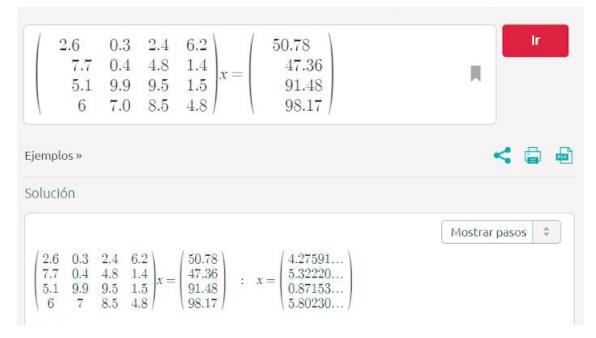
```
0.3
                    6.2
                         50.78]
  2.6
              2.4
                    1.4 47.36
  7.7
        0.4
              4.7
  5.1
        9.9
              9.5
                    1.5 91.48
  6.1
              8.5
                   4.8 98.17]]
Pivoteo parcial por filas
[[ 7.7
       0.4
             4.7
                   1.4 47.36]
        9.9
              9.5
                   1.5 91.48]
  5.1
              8.5
                    4.8 98.17
  6.1
  2.6 0.3
                   6.2 50.78]]
              2.4
eliminacion hacia adelante
[[ 7.7
              0.4
                         4.7
                                     1.4
                                                47.36
              9.63506494 6.38701299 0.57272727 60.11168831
                          0.34643483 3.29365144 18.95610055]
                                     -0.97235235 -4.74292117]]
                          0.
  0.
eliminación hacia atrás
[[ 1.00000000e+00 0.00000000e+00 -4.78866920e-18 0.000000000e+00
   1.49421401e-01]
[ 0.00000000e+00 1.00000000e+00 9.21818821e-17 0.00000000e+00
  4.18223069e-01]
[ 0.00000000e+00 0.00000000e+00 1.00000000e+00 0.00000000e+00
  8.34324968e+00]
[-0.00000000e+00 -0.00000000e+00 -0.00000000e+00 1.00000000e+00
  4.87778036e+00]]
solución de X:
[[0.1494214
 [0.41822307
 [8.34324968]
 [4.87778036]]
Operaciones totales:
PS C:\Users\Sandra Isabel>
```

• Tasa de cambio : $a_{41} = 6 \ por \ a_{41} = 6.1$

$$\begin{pmatrix} 2.5 \\ 3.2 \\ 4.1 \\ 5.4 \end{pmatrix} - \begin{pmatrix} 0.14942 \\ 0.41822 \\ 8.34324 \\ 4.87778 \end{pmatrix} = \begin{pmatrix} 2.35058 \\ 2.78178 \\ -4.24324 \\ 0.52222 \end{pmatrix}$$

a4,1=6	a4,1=6.1	Tasa de cambio
2,50	0,15	9402,3%
3,20	0,42	8693,1%
4,10	8,34	-10349,4%
5,40	4,88	967,1%

• Cambiar $a_{23} = 4.7 \ por \ a_{23} = 4.8 \ \text{¿Qué efecto tiene esto en la solución, en % cómo cambió la solución?}$



Solución algoritmo Gauss Jordan:

```
2.4
                     6.2 50.78]
  2.6
        0.3
                    1.4 47.36]
1.5 91.48]
        0.4
              4.8
  5.1 9.9
              9.5
 6. 7.
               8.5
                   4.8 98.17]]
Pivoteo parcial por filas
        0.4 4.8
                    1.4 47.36]
  5.1 9.9 9.5 1.5 91.48]
6. 7. 8.5 4.8 98.17]
2.6 0.3 2.4 6.2 50.78]]
eliminacion hacia adelante
[[ 7.7
               0.4
                          4.8
                                                  47.36
               9.63506494 6.32077922 0.57272727 60.11168831
                           0.37208519 3.31152446 19.5387559
 0.
[ 0.
                                      -0.25455171 -1.47698642]]
eliminación hacia atrás
[[ 1.000000000e+00 0.000000000e+00 4.78866920e-18 0.00000000e+00
  4.27591399e+00]
[ 0.00000000e+00 1.00000000e+00 -9.21818821e-17 0.00000000e+00
  5.32220467e+00]
[ 0.00000000e+00 0.00000000e+00 1.00000000e+00 0.00000000e+00
  8.71532255e-01]
[-0.00000000e+00 -0.00000000e+00 -0.00000000e+00 1.00000000e+00
  5.80230400e+00]]
solución de X:
[[4.27591399]
 5.32220467
 [0.87153225
5.802304
[5.802304 ]]
Operaciones totales:
PS C:\Users\Sandra Isabel>
```

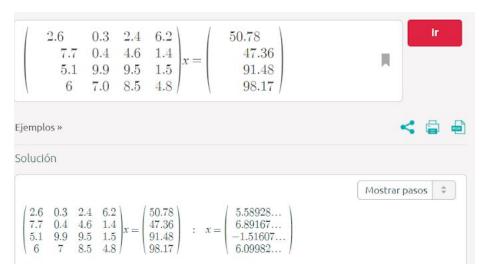
Tasa de cambio $a_{23} = 4.7 \ por \ a_{23} = 4.8$:

$$\begin{pmatrix} 2.5 \\ 3.2 \\ 4.1 \\ 5.4 \end{pmatrix} - \begin{pmatrix} 4.27591 \\ 5.3222 \\ 0.87153 \\ 5.8023 \end{pmatrix} = \begin{pmatrix} -1.77591 \\ -2.1222 \\ 3.22847 \\ -0.4023 \end{pmatrix}$$

a2,3=4.7	a2,3=4.8	Tasa de cambio
2,50	4,28	-7103,6%
3,20	5,32	-6631,9%
4,10	0,87	7874,3%
5,40	5,80	-745,0%

• Cambiar $a_{23} = 4.7 \ por \ a_{23} = 4.6$ ¿Qué efecto tiene esto en la solución, en % cómo cambió la solución?

Solución Symbolab:



Solución algoritmo Gauss Jordan:

```
Matrız aumentada:
[[ 2.6
         0.3
               2.4
                     6.2 50.78]
   7.7
               4.6
                     1.4 47.36]
         0.4
   5.1
         9.9
                     1.5 91.48]
               9.5
                     4.8 98.17]]
   6.
               8.5
Pivoteo parcial por filas
[[ 7.7
         0.4
               4.6
                     1.4
                         47.36
   5.1
         9.9
               9.5
                     1.5
   6.
         7.
               8.5
                    4.8
                          98.17]
       0.3
   2.6
               2.4
                    6.2
                          50.78]]
eliminacion hacia adelante
                          4.6
[[ 7.7
               0.4
                                                 47.36
                                       1.4
               9.63506494 6.45324675 0.57272727 60.11168831
   0.
   0.
               0.
                           0.4359752 3.31152446 19.5387559
               0.
                                       0.12488793 0.76179471]]
                           0.
eliminación hacia atrás
[[ 1.
                           0.
                                                  5.5892858
   0.
               1.
                           0.
                                       0.
                                                  6.89167471]
   0.
               0.
                           1.
                                       0.
                                                  -1.5160713
                                                  6.09982671]]
 0.
                           0.
               0.
solución de X:
[[ 5.5892858
   6.89167471]
  -1.5160713
 [ 6.09982671]]
Operaciones totales:
PS C:\Users\Sandra Isabel> [
```

Tasa de cambio $a_{23} = 4.7 \ por \ a_{23} = 4.6$

$$\begin{pmatrix} 2.5 \\ 3.2 \\ 4.1 \\ 5.4 \end{pmatrix} - \begin{pmatrix} 5.58928 \\ 6.89167 \\ -1.51607 \\ 6.09982 \end{pmatrix} = \begin{pmatrix} -3.08928 \\ -3.69167 \\ 5.61607 \\ -0.69982 \end{pmatrix}$$

a2,3=4.7	a2,3=4.6	Tasa de cambio
2,50	5,59	-12357,1%
3,20	6,89	-11536,5%
4,10	-1,52	13697,7%
5,40	6,10	-1296,0%