**LU SIMPLE**

```
[[ 4  1  1  0  1]
 [-1 -3  1  1  0]
 [ 2  1  5 -1 -1]
 [-1 -1 -1  4  0]
 [ 0  2 -1  1  4]]
```

----------------------------------------------------

```
[[ 4  1  1  0  1]
 [ 0 -2  1  1  0]
 [ 0  0  4 -1 -1]
 [ 0  0  0  4  0]
 [ 0  2 -1  1  4]]
[[ 1.    0.    0.    0.    0.  ]
 [-0.25 1.    0.    0.    0.  ]
 [ 0.5  0.    1.    0.    0.  ]
 [-0.25 0.    0.    1.    0.  ]
 [ 0.    0.    0.    0.    1. ]]
```

----------------------------------------------------

```
[[ 4  1  1  0  1]
 [ 0 -2  1  1  0]
 [ 0  0  4 -1 -1]
 [ 0  0  0  4  0]
 [ 0  0  0  2  4]]
[[ 1.    0.    0.    0.    0.  ]
 [-0.25 1.    0.    0.    0.  ]
 [ 0.5  -0.   1.    0.    0.  ]
 [-0.25 -0.   0.    1.    0.  ]
 [ 0.   -1.    0.    0.    1. ]]
```

----------------------------------------------------

```
[[ 4  1  1  0  1]
 [ 0 -2  1  1  0]
 [ 0  0  4 -1 -1]
 [ 0  0  0  4  0]
 [ 0  0  0  2  4]]
[[ 1.    0.    0.    0.    0.  ]
 [-0.25 1.    0.    0.    0.  ]
 [ 0.5  -0.   1.    0.    0.  ]
 [-0.25 -0.   0.    1.    0.  ]
 [ 0.   -1.    0.    0.    1. ]]
```

----------------------------------------------------

```
[[ 4  1  1  0  1]
 [ 0 -2  1  1  0]
 [ 0  0  4 -1 -1]
 [ 0  0  0  4  0]
 [ 0  0  0  0  4]]
[[ 1.    0.    0.    0.    0.  ]
 [-0.25 1.    0.    0.    0.  ]
 [ 0.5  -0.   1.    0.    0.  ]
 [-0.25 -0.   0.    1.    0.  ]
 [ 0.   -1.    0.    0.5   1. ]]
```

----------------------------------------------------
Out[9]:
array([[ 0.90820312],
    [-1.8984375 ],
    [ 1.828125  ],
    [ 1.875    ],
    [ 2.4375   ]])

**LU PARTIAL**
[[ 4  1  1  0  1]
 [-1 -3  1  1  0]
 [ 2  1  5 -1 -1]
 [-1 -1 -1  4  0]
 [ 0  2 -1  1  4]]
----------------------------------------------------
[[ 4  1  1  0  1]
 [ 0 -2  1  1  0]
 [ 0  0  4 -1 -1]
 [ 0  0  0  4  0]
 [ 0  2 -1  1  4]]
[[ 1.   0.   0.   0.   0. ]
 [-0.25 1.   0.   0.   0. ]
 [ 0.5  0.   1.   0.   0. ]
 [-0.25 0.   0.   1.   0. ]
 [ 0.   0.   0.   0.   1. ]]
----------------------------------------------------
[[ 4  1  1  0  1]
 [ 0 -2  1  1  0]
 [ 0  0  4 -1 -1]
 [ 0  0  0  4  0]
 [ 0  0  0  2  4]]
[[ 1.   0.   0.   0.   0. ]
 [-0.25 1.   0.   0.   0. ]
 [ 0.5 -0.   1.   0.   0. ]
 [-0.25 -0.   0.   1.   0. ]
 [ 0.  -1.   0.   0.   1. ]]
----------------------------------------------------
[[ 4  1  1  0  1]
 [ 0 -2  1  1  0]
 [ 0  0  4 -1 -1]
 [ 0  0  0  4  0]
 [ 0  0  0  2  4]]
[[ 1.   0.   0.   0.   0. ]
 [-0.25 1.   0.   0.   0. ]
 [ 0.5 -0.   1.   0.   0. ]
 [-0.25 -0.   0.   1.   0. ]
 [ 0.  -1.   0.   0.   1. ]]
----------------------------------------------------
[[ 4  1  1  0  1]
 [ 0 -2  1  1  0]

```
 [ 0  0  4 -1 -1]
 [ 0  0  0  4  0]
 [ 0  0  0  0  4]]
[[ 1.    0.    0.    0.    0.  ]
 [-0.25  1.    0.    0.    0.  ]
 [ 0.5  -0.    1.    0.    0.  ]
 [-0.25 -0.    0.    1.    0.  ]
 [ 0.   -1.    0.    0.5   1.  ]]
------------------------------------------------------
```

Out[10]:
```
array([[ 0.90820312],
       [-1.8984375 ],
       [ 1.828125  ],
       [ 1.875     ],
       [ 2.4375    ]])
```

**CROUT**
```
[[ 4.          0.          0.          0.        ]
 [ 1.         15.75        0.          0.        ]
 [ 0.         -1.3        -3.75238095  0.        ]
 [14.          8.5        -3.61904762 13.94923858]]
[[ 1.         -0.25        0.          0.75      ]
 [ 0.          1.          0.19047619  0.46031746]
 [ 0.          0.          1.         -0.45262267]
 [ 0.          0.          0.          1.        ]]
```
Out[17]:
```
array([[ 0.52510917],
       [ 0.25545852],
       [-0.41048035],
       [-0.28165939]])
```

**DOOLITLE**
```
[[ 1.          0.          0.          0.        ]
 [ 0.25        1.          0.          0.        ]
 [ 0.         -0.08253968  1.          0.        ]
 [ 3.5         0.53968254  0.96446701  1.        ]]
[[ 4.         -1.          0.          3.        ]
 [ 0.         15.75        3.          7.25      ]
 [ 0.          0.         -3.75238095  1.6984127 ]
 [ 0.          0.          0.         13.94923858]]
```
Out[18]:
```
array([[ 0.52510917],
       [ 0.25545852],
       [-0.41048035],
       [-0.28165939]])
```

**CHOLESKY**
```
(array([[ 2.        , 0.        , 0.        , 0.        ],
```

```
       [ 0.5     ,  3.96862697,  0.     ,  0.      ],
       [ 0.     , -0.32756921,      nan,  0.     ],
       [ 7.     ,  2.14179868,      nan,      nan]]),
array([[ 2.     , -0.5    ,  0.     ,  1.5     ],
       [ 0.     ,  3.96862697,  0.75592895,  1.82682829],
       [ 0.     ,  0.     ,      nan,      nan],
       [ 0.     ,  0.     ,  0.     ,      nan]]))
```

**JACOBI**
```
[[0.]
 [0.]
 [0.]
 [0.]]
[[ 0.25    ]
 [ 0.06451613]
 [-0.25    ]
 [ 0.03333333]]
[[ 0.24112903]
 [ 0.07956989]
 [-0.26180108]
 [-0.11075269]]
[[ 0.35295699]
 [ 0.15679327]
 [-0.3063172 ]
 [-0.1099086 ]]
[[ 0.37162977]
 [ 0.15775893]
 [-0.33118268]
 [-0.17793329]]
[[ 0.4228897 ]
 [ 0.19647642]
 [-0.35020331]
 [-0.18846589]]
[[ 0.44046853]
 [ 0.20228693]
 [-0.36568296]
 [-0.22010815]]
[[ 0.46565284]
 [ 0.22048036]
 [-0.37627299]
 [-0.230312  ]]
[[ 0.47785409]
 [ 0.22617175]
 [-0.38499192]
 [-0.24580292]]
[[ 0.49089513]
 [ 0.23506742]
 [-0.39110162]
 [-0.25302666]]
```

```
[[ 0.49853685]
 [ 0.23913697]
 [-0.39597924]
 [-0.2610024 ]]
[[ 0.50553605]
 [ 0.24370452]
 [-0.39949518]
 [-0.26557197]]
[[ 0.51010511]
 [ 0.24629195]
 [-0.40223626]
 [-0.26983392]]
[[ 0.51394843]
 [ 0.24872742]
 [-0.40424921]
 [-0.27258013]]
[[ 0.51661695]
 [ 0.25028647]
 [-0.40579595]
 [-0.27491378]]
[[ 0.51875696]
 [ 0.25161814]
 [-0.40694439]
 [-0.27652205]]
[[ 0.52029607]
 [ 0.25253243]
 [-0.40781946]
 [-0.27781923]]
[[ 0.52149753]
 [ 0.25327201]
 [-0.40847333]
 [-0.2787482 ]]
[[ 0.52237915]
 [ 0.25380052]
 [-0.40896916]
 [-0.27947574]]
[[ 0.52305693]
 [ 0.25421511]
 [-0.409341  ]
 [-0.2800083 ]]
[[ 0.52356   ]
 [ 0.25451822]
 [-0.40962219]
 [-0.28041849]]
[[ 0.52394342]
 [ 0.2547519 ]
 [-0.40983351]
 [-0.28072252]]
[[ 0.52422986]
 [ 0.25492498]
```

```
  [-0.40999306]
  [-0.28095448]]
[[ 0.52444711]
 [ 0.25505711]
 [-0.4101131 ]
 [-0.28112764]]
[[ 0.52461001]
 [ 0.2551557 ]
 [-0.41020366]
 [-0.28125904]]
[[ 0.52473321]
 [ 0.25523054]
 [-0.41027184]
 [-0.28135753]]
[[ 0.52482578]
 [ 0.25528662]
 [-0.41032324]
 [-0.28143204]]
[[ 0.52489568]
 [ 0.25532905]
 [-0.41036196]
 [-0.28148802]]
[[ 0.52494828]
 [ 0.25536092]
 [-0.41039115]
 [-0.28153029]]
[[ 0.52498795]
 [ 0.255385  ]
 [-0.41041313]
 [-0.28156209]]
[[ 0.52501782]
 [ 0.25540311]
 [-0.4104297 ]
 [-0.28158609]]
[[ 0.52504034]
 [ 0.25541677]
 [-0.41044218]
 [-0.28160415]]
[[ 0.5250573 ]
 [ 0.25542706]
 [-0.41045159]
 [-0.28161777]]
[[ 0.52507009]
 [ 0.25543481]
 [-0.41045868]
 [-0.28162802]]
[[ 0.52507972]
 [ 0.25544065]
 [-0.41046402]
 [-0.28163576]]
```

```
[[ 0.52508698]
 [ 0.25544506]
 [-0.41046805]
 [-0.28164158]]
[[ 0.52509245]
 [ 0.25544837]
 [-0.41047108]
 [-0.28164597]]
[[ 0.52509657]
 [ 0.25545087]
 [-0.41047336]
 [-0.28164928]]
[[ 0.52509968]
 [ 0.25545276]
 [-0.41047509]
 [-0.28165177]]
[[ 0.52510202]
 [ 0.25545418]
 [-0.41047638]
 [-0.28165365]]
[[ 0.52510378]
 [ 0.25545525]
 [-0.41047736]
 [-0.28165506]]
[[ 0.52510511]
 [ 0.25545605]
 [-0.4104781 ]
 [-0.28165613]]
[[ 0.52510611]
 [ 0.25545666]
 [-0.41047865]
 [-0.28165693]]
[[ 0.52510686]
 [ 0.25545712]
 [-0.41047907]
 [-0.28165754]]
[[ 0.52510743]
 [ 0.25545746]
 [-0.41047939]
 [-0.28165799]]
[[ 0.52510786]
 [ 0.25545772]
 [-0.41047962]
 [-0.28165834]]
[[ 0.52510818]
 [ 0.25545792]
 [-0.4104798 ]
 [-0.2816586 ]]
[[ 0.52510843]
 [ 0.25545806]
```

```
  [-0.41047994]
  [-0.28165879]]
[[ 0.52510861]
 [ 0.25545818]
 [-0.41048004]
 [-0.28165894]]
[[ 0.52510875]
 [ 0.25545826]
 [-0.41048012]
 [-0.28165905]]
[[ 0.52510885]
 [ 0.25545832]
 [-0.41048017]
 [-0.28165913]]
[[ 0.52510893]
 [ 0.25545837]
 [-0.41048022]
 [-0.2816592 ]]
iterations 52
error 8.997367404010961e-08
Out[20]:
array([[ 0.52510899],
       [ 0.25545841],
       [-0.41048025],
       [-0.28165924]])
```

**GAUSS SEIDEL**

```
[[0.]
 [0.]
 [0.]
 [0.]]
[[ 0.25      ]
 [ 0.0483871 ]
 [-0.26572581]
 [-0.1091129 ]]
[[ 0.34393145]
 [ 0.15007414]
 [-0.32878014]
 [-0.17409904]]
[[ 0.41809282]
 [ 0.19103484]
 [-0.35996356]
 [-0.21761336]]
[[ 0.46096873]
 [ 0.21676315]
 [-0.3802917 ]
 [-0.24326538]]
[[ 0.48663982]
 [ 0.23228118]
```

```
  [-0.39238936]
  [-0.25863807]]
[[ 0.50204885]
 [ 0.24156283]
 [-0.39963339]
 [-0.26785883]]
[[ 0.51128483]
 [ 0.24712813]
 [-0.40397782]
 [-0.27338613]]
[[ 0.51682163]
 [ 0.25046457]
 [-0.40658217]
 [-0.27669967]]
[[ 0.52014089]
 [ 0.25246471]
 [-0.40814344]
 [-0.2786861 ]]
[[ 0.52213075]
 [ 0.25366376]
 [-0.4090794 ]
 [-0.27987694]]
[[ 0.52332364]
 [ 0.25438258]
 [-0.4096405 ]
 [-0.28059083]]
[[ 0.52403877]
 [ 0.25481351]
 [-0.40997687]
 [-0.2810188 ]]
[[ 0.52446748]
 [ 0.25507184]
 [-0.41017852]
 [-0.28127536]]
[[ 0.52472448]
 [ 0.25522671]
 [-0.41029941]
 [-0.28142917]]
[[ 0.52487856]
 [ 0.25531955]
 [-0.41037188]
 [-0.28152138]]
[[ 0.52497092]
 [ 0.25537521]
 [-0.41041532]
 [-0.28157665]]
[[ 0.52502629]
 [ 0.25540857]
 [-0.41044137]
 [-0.28160979]]
```

```
[[ 0.52505948]
 [ 0.25542858]
 [-0.41045698]
 [-0.28162965]]
[[ 0.52507938]
 [ 0.25544057]
 [-0.41046634]
 [-0.28164156]]
[[ 0.52509131]
 [ 0.25544776]
 [-0.41047195]
 [-0.2816487 ]]
[[ 0.52509847]
 [ 0.25545206]
 [-0.41047531]
 [-0.28165298]]
[[ 0.52510275]
 [ 0.25545465]
 [-0.41047733]
 [-0.28165555]]
[[ 0.52510532]
 [ 0.2554562 ]
 [-0.41047854]
 [-0.28165709]]
[[ 0.52510686]
 [ 0.25545713]
 [-0.41047926]
 [-0.28165801]]
[[ 0.52510779]
 [ 0.25545768]
 [-0.4104797 ]
 [-0.28165856]]
[[ 0.52510834]
 [ 0.25545802]
 [-0.41047996]
 [-0.28165889]]
[[ 0.52510867]
 [ 0.25545822]
 [-0.41048012]
 [-0.28165909]]
[[ 0.52510887]
 [ 0.25545834]
 [-0.41048021]
 [-0.28165921]]
[[ 0.52510899]
 [ 0.25545841]
 [-0.41048027]
 [-0.28165928]]
iterations 30
error 9.96798326917106e-08
```

Out[21]:
array([[ 0.52510906],
       [ 0.25545845],
       [-0.4104803 ],
       [-0.28165932]])

**SOR**
[[0.]
 [0.]
 [0.]
 [0.]]
[[ 0.375     ]
 [ 0.06048387]
 [-0.40448589]
 [-0.26806956]]
[[ 0.5117597 ]
 [ 0.34197623]
 [-0.45004916]
 [-0.30469599]]
[[ 0.59014422]
 [ 0.23522845]
 [-0.39033638]
 [-0.30859371]]
[[ 0.51530648]
 [ 0.28152633]
 [-0.4443708 ]
 [-0.27123634]]
[[ 0.52806002]
 [ 0.24390875]
 [-0.38360511]
 [-0.28336154]]
[[ 0.52121751]
 [ 0.25512531]
 [-0.42445767]
 [-0.27939858]]
[[ 0.52438664]
 [ 0.25800267]
 [-0.40379938]
 [-0.28225196]]
[[ 0.52709114]
 [ 0.25251377]
 [-0.41262971]
 [-0.28222923]]
[[ 0.52365497]
 [ 0.25813679]
 [-0.41094639]
 [-0.2810727 ]]
[[ 0.5261806 ]
 [ 0.25369679]
 [-0.40914648]

```
  [-0.28212891]]
[[ 0.52444102]
 [ 0.25638029]
 [-0.41179033]
 [-0.28131836]]
[[ 0.52540526]
 [ 0.25508527]
 [-0.40950273]
 [-0.28184609]]
[[ 0.5250312 ]
 [ 0.2555134 ]
 [-0.41107293]
 [-0.28158444]]
[[ 0.52508442]
 [ 0.25554748]
 [-0.41019651]
 [-0.2816734 ]]
[[ 0.52517067]
 [ 0.25533652]
 [-0.41056857]
 [-0.28167376]]
[[ 0.52504884]
 [ 0.25556209]
 [-0.41049266]
 [-0.2816371 ]]
[[ 0.5251531 ]
 [ 0.25538879]
 [-0.41043101]
 [-0.28167892]]
[[ 0.52508303]
 [ 0.2554967 ]
 [-0.41053169]
 [-0.28164601]]
[[ 0.52512151]
 [ 0.25544277]
 [-0.41044149]
 [-0.28166689]]
[[ 0.52510554]
 [ 0.25546126]
 [-0.41050422]
 [-0.28165617]]
[[ 0.52510839]
 [ 0.25546165]
 [-0.41046862]
 [-0.28166007]]
[[ 0.5251115 ]
 [ 0.25545384]
 [-0.41048422]
 [-0.2816599 ]]
[[ 0.52510682]
```

```
 [ 0.2554626 ]
 [-0.41048062]
 [-0.28165854]]
[[ 0.52511092]
 [ 0.25545573]
 [-0.41047851]
 [-0.28166015]]
[[ 0.52510811]
 [ 0.25546007]
 [-0.41048235]
 [-0.28165885]]
[[ 0.52510968]
 [ 0.25545785]
 [-0.41047881]
 [-0.28165969]]
[[ 0.52510901]
 [ 0.25545865]
 [-0.41048131]
 [-0.28165925]]
[[ 0.52510915]
 [ 0.25545862]
 [-0.41047987]
 [-0.28165942]]
[[ 0.52510926]
 [ 0.25545834]
 [-0.41048052]
 [-0.28165941]]
[[ 0.52510908]
 [ 0.25545868]
 [-0.41048035]
 [-0.28165936]]
[[ 0.52510924]
 [ 0.2554584 ]
 [-0.41048028]
 [-0.28165942]]
[[ 0.52510913]
 [ 0.25545858]
 [-0.41048043]
 [-0.28165937]]
[[ 0.52510919]
 [ 0.25545849]
 [-0.41048029]
 [-0.2816594 ]]
[[ 0.52510916]
 [ 0.25545852]
 [-0.41048039]
 [-0.28165938]]
iterations 35
error 5.945865342973044e-08
Out[24]:
```

array([[ 0.52510917],
    [ 0.25545852],
    [-0.41048033],
    [-0.28165939]])

**Vandermonde**
[-1.  1. -1.  1.]
[ 0.  0.  0.  1.]
[27.  9.  3.  1.]
[64. 16.  4.  1.]

**Newton**
[ 15.5        0.          0.          0.        ]
[ 3.        -12.5         0.          0.        ]
[ 8.          1.66666667  3.54166667  0.        ]
[ 1.         -7.         -2.16666667 -1.14166667]

**Trazadores lineales**
M
[-1.  1.  0.  0.  0.  0.]
[ 0.  1.  0.  0.  0.  0.]
[ 0.  0.  3.  1.  0.  0.]
[ 0.  0.  0.  0.  4.  1.]
[ 0.  1.  0. -1.  0.  0.]
[ 0.  0.  3.  1. -3. -1.]

y
 [15.5]
 [ 3. ]
 [ 8. ]
 [ 1. ]
 [ 0. ]
 [ 0. ]

sol
 [-12.5      ]
 [ 3.       ]
 [ 1.66666667]
 [ 3.       ]
 [-7.       ]
 [ 29.      ]

**Trazadores Cuadráticos**
M
[ 1. -1.  1.  0.  0.  0.  0.  0.  0.]
[ 0.  0.  1.  0.  0.  0.  0.  0.  0.]
[ 0.  0.  0.  9.  3.  1.  0.  0.  0.]

```
[ 0.  0.  0.  0.  0.  0. 16.  4.  1.]
[ 0.  0.  1.  0.  0. -1.  0.  0.  0.]
[ 0.  0.  0.  9.  3.  1. -9. -3. -1.]
[ 0.  1.  0.  0. -1.  0.  0.  0.  0.]
[ 0.  0.  0.  6.  1.  0. -6. -1.  0.]
[ 2.  0.  0.  0.  0.  0.  0.  0.  0.]
```

y
```
[15.5]
[ 3. ]
[ 8. ]
[ 1. ]
[ 0. ]
[ 0. ]
[ 0. ]
[ 0. ]
```

sol
```
[  0.      ]
[-12.5     ]
[  3.      ]
[  4.72222222]
[-12.5     ]
[  3.      ]
[-22.83333333]
[152.83333333]
[-245.     ]
```

Trazadores cúbicos
M
```
[-1.  1. -1.  1.  0.  0.  0.  0.  0.  0.  0.  0.]
[ 0.  0.  0.  1.  0.  0.  0.  0.  0.  0.  0.  0.]
[ 0.  0.  0.  0. 27.  9.  3.  1.  0.  0.  0.  0.]
[ 0.  0.  0.  0.  0.  0.  0.  0. 64. 16.  4.  1.]
[ 0.  0.  0.  1.  0.  0.  0. -1.  0.  0.  0.  0.]
[ 0.  0.  0.  0. 27.  9.  3.  1. -27. -9. -3. -1.]
[ 0.  0.  1.  0.  0.  0. -1.  0.  0.  0.  0.  0.]
[ 0.  0.  0.  0. 27.  6.  1.  0. -27. -6. -1.  0.]
[ 0.  2.  0.  0.  0. -2.  0.  0.  0.  0.  0.  0.]
[ 0.  0.  0.  0. 18.  2.  0.  0. -18. -2.  0.  0.]
[ 6.  2.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.]
[ 0.  0.  0.  0.  0.  0.  0.  0.  6.  2.  0.  0.]
```

y
```
[15.5]
[ 3. ]
[ 8. ]
[ 1. ]
[ 0. ]
```

```
[ 0. ]
[ 0. ]
[ 0. ]
[ 0. ]
[ 0. ]
[ 0. ]
[ 0. ]

sol
 [-1.86724806]
 [ 5.60174419]
 [-5.03100775]
 [ 3.       ]
 [-1.12306202]
 [ 5.60174419]
 [-5.03100775]
 [ 3.       ]
 [-0.75096899]
 [ 2.25290698]
 [ 5.01550388]
 [-7.04651163]
```