

```
Quit[];
```

```
(* METODO DI JACOBI *)
```

```
(* Esempio 1. *)
```

```
In[324]:= Clear[a, x]
n = 4;
a = {{10, 5, 0, 0}, {5, 10, -4, 0}, {0, -4, 8, -1}, {0, 0, -1, 5}};
b = {6, 25, -11, -11};
x = Table[xx[i], {i, 1, n}];
```

```
In[329]:= MatrixForm[a]
Det[a];
MatrixForm[b]
sys = Thread[Dot[a, x] == b];
xsol = x /. Solve[sys, x][[1]] // N
```

```
Out[329]/MatrixForm=

$$\begin{pmatrix} 10 & 5 & 0 & 0 \\ 5 & 10 & -4 & 0 \\ 0 & -4 & 8 & -1 \\ 0 & 0 & -1 & 5 \end{pmatrix}$$

```

```
Out[331]/MatrixForm=
```

```

$$\begin{pmatrix} 6 \\ 25 \\ -11 \\ -11 \end{pmatrix}$$

```

```
Out[333]= {-0.797647, 2.79529, -0.258824, -2.25176}
```

```
In[334]:= Clear[eq, f, ff]
Do[eq[i] = Reduce[sys[[i]], xx[i]], {i, 1, n}];
Do[ff[i] = eq[i][[2]], {i, 1, n}];
f = Table[ff[i], {i, 1, n}]
```

```
Out[337]=  $\left\{ \frac{3}{5} - \frac{xx[2]}{2}, \frac{5}{2} - \frac{xx[1]}{2} + \frac{2xx[3]}{5}, -\frac{11}{8} + \frac{xx[2]}{2} + \frac{xx[4]}{8}, -\frac{11}{5} + \frac{xx[3]}{5} \right\}$ 
```

```
In[338]:= xk[0] = Table[0.0, {i, 1, n}]
kmax = 100; tol = 1.0 × 10-6;
k = 0;
While[k < kmax, sys1 = Table[xx[i] == xk[k][[i]], {i, 1, n}];
sol1 = Solve[sys1, x][[1]]; xk[k+1] = f /. sol1 // N;
norm = Max[Abs[xk[k+1] - xk[k]]]; Print[k, " ", norm]; If[norm ≤ tol, Break[]];
k++]
Print[xk[k]]
```

```
Out[338]= {0., 0., 0., 0.}
```

```
0 2.5
```

```
1 1.25
```

```
2 1.015
```

```
3 0.531875
```

```
4 0.4665
```

```
5 0.246547
```

```
6 0.215244
```

```
7 0.113786
```

```
8 0.0993252
```

```
9 0.0525072
```

```
10 0.0458342
11 0.0242298
12 0.0211505
13 0.011181
14 0.00976
15 0.00515952
16 0.00450381
17 0.00238089
18 0.00207831
19 0.00109868
20 0.000959048
21 0.000506991
22 0.000442559
23 0.000233954
24 0.000204221
25 0.000107959
26 0.0000942391
27 0.0000498185
28 0.0000434872
29 0.0000229891
30 0.0000200674
31 0.0000106084
32  $9.26023 \times 10^{-6}$ 
33  $4.89533 \times 10^{-6}$ 
34  $4.27319 \times 10^{-6}$ 
35  $2.25898 \times 10^{-6}$ 
36  $1.97189 \times 10^{-6}$ 
37  $1.04242 \times 10^{-6}$ 
38  $9.09939 \times 10^{-7}$ 
{-0.797647, 2.79529, -0.258824, -2.25176}
```

(* Esempio 2. *)

```
In[343]:= Clear[a, x]
n = 3;
a = {{10, 5, 0}, {5, 10, -4}, {0, -4, 8}};
b = {6, 25, -11};
x = Table[xx[i], {i, 1, n}];
```

```
In[348]:= MatrixForm[a]
Det[a];
MatrixForm[b]
sys = Thread[Dot[a, x] == b];
xsol = x /. Solve[sys, x][[1]] // N
```

```
Out[348]/MatrixForm=

$$\begin{pmatrix} 10 & 5 & 0 \\ 5 & 10 & -4 \\ 0 & -4 & 8 \end{pmatrix}$$

```

```
Out[350]/MatrixForm=

$$\begin{pmatrix} 6 \\ 25 \\ -11 \end{pmatrix}$$

```

```
Out[352]= {-0.9, 3., 0.125}
```

```
In[353]:= Clear[eq, f, ff]
Do[eq[i] = Reduce[sys[[i]], xx[i]], {i, 1, n}];
Do[ff[i] = eq[i][[2]], {i, 1, n}];
f = Table[ff[i], {i, 1, n}]
```

```
Out[356]=  $\left\{ \frac{3}{5} - \frac{xx[2]}{2}, \frac{5}{2} - \frac{xx[1]}{2} + \frac{2xx[3]}{5}, -\frac{11}{8} + \frac{xx[2]}{2} \right\}$ 
```

```
In[357]:= xk[0] = Table[0.0, {i, 1, n}]
kmax = 100; tol = 1.0 × 10-6;
k = 0;
While[k < kmax, sys1 = Table[xx[i] == xk[k][[i]], {i, 1, n}];
sol1 = Solve[sys1, x][[1]]; xk[k + 1] = f /. sol1 // N;
norm = Max[Abs[xk[k + 1] - xk[k]]]; Print[k, " ", norm]; If[norm ≤ tol, Break[]];
k++]
Print[xk[k]]
```

```
Out[357]= {0., 0., 0.}
```

```
0 2.5
```

```
1 1.25
```

```
2 1.125
```

```
3 0.5625
```

```
4 0.50625
```

```
5 0.253125
```

```
6 0.227813
```

```
7 0.113906
```

```
8 0.102516
```

```
9 0.0512578
```

```
10 0.046132
```

```
11 0.023066
```

```
12 0.0207594
```

```
13 0.0103797
```

```
14 0.00934174
```

```
15 0.00467087
```

```
16 0.00420378
```

17 0.00210189

18 0.0018917

19 0.000945851

20 0.000851266

21 0.000425633

22 0.00038307

23 0.000191535

24 0.000172381

25 0.0000861907

26 0.0000775716

27 0.0000387858

28 0.0000349072

29 0.0000174536

30 0.0000157082

31 7.85412×10^{-6}

32 7.06871×10^{-6}

33 3.53436×10^{-6}

34 3.18092×10^{-6}

35 1.59046×10^{-6}

36 1.43141×10^{-6}

37 7.15707×10^{-7}

{-0.899999, 3., 0.124999}