RELACIÓN 2 MAXIMA

EJERCICIO 1

→ A:matrix([0.34,-1.99,2/7,0],[0,1.1,2.3,-3.57],[0,0,3.2,33],[0,0,0,66.72]);

(A) $$\begin{pmatrix} 0.34 & -1.99 & \frac{2}{7} & 0 \\ 0 & 1.1 & 2.3 & -3.57 \\ 0 & 0 & 3.2 & 33 \\ 0 & 0 & 0 & 66.72 \end{pmatrix}$$

→ b:[1,34,78,-9.42];

(b) $$[1, 34, 78, -9.42]$$

→ N:matrix_size(A)[1];

(N) $$4$$

→ x:makelist(0, i, 1, N);

(x) $$[0, 0, 0, 0]$$

→ x[N]:b[N]/A[N, N];

(x[N]) $$-0.1411870503597122$$

→ for i:N-1 thru 1 step -1 do x[i]:1/A[i,i]*(b[i] - apply("+", makelist(A[i, j]*x[j], j, i+1, N)));

(% o17) $$\mathit{done}$$

→ x;

(% o18)
$[-156.6572049746565, -23.55938010954871, 25.83099145683453, -0.1411870503597122]$

EJERCICIO 2

→ A:matrix([0.24,1.1,3/2,3.45],[-1.2,1,3.5,6.7],[33.1,1,2,-3/8],[4,17,71,-4/81]);

(A) $$\begin{pmatrix} 0.24 & 1.1 & \frac{3}{2} & 3.45 \\ -1.2 & 1 & 3.5 & 6.7 \\ 33.1 & 1 & 2 & -\frac{3}{8} \\ 4 & 17 & 71 & -\frac{4}{81} \end{pmatrix}$$

→ b:[1,2,4,-21/785];

(b) $[1, 2, 4, -\frac{21}{785}]$

→ N:matrix_size(A)[1];

(N) 4

→ for i:1 thru N-1 do (for j:i+1 thru N do (b[j]:(b[j]-b[i]*A[j, i]/A[i, i]), A[j]:(A[j] - A[i]*(A[j, i]/A[i, i]))));

(% o13) *done*

→ A;

(% o14) $$\begin{pmatrix} 0.24 & 1.1 & \frac{3}{2} & 3.45 \\ 0.0 & 6.5 & 11.0 & 23.95 \\ 0.0 & 0.0 & 50.16987179487182 & 79.11474358974363 \\ 0.0 & 0.0 & 0.0 & -128.7338968666914 \end{pmatrix}$$

→ b;

(% o15) $[1, 7.0, 28.38461538461538, -42.55955680541488]$

→ x:makelist(0, i, 1, N);

(x) $[0, 0, 0, 0]$

→ x[N]:b[N]/A[N, N];

(x[N]) 0.3306010137290167

→ for i:N-1 thru 1 step -1 do suma:x[i]:1/A[i,i]*(b[i] - apply("+", makelist(A[i, j]*x[j], j, i+1, N)));

(% o18) *done*

→ x;

(% o19)
$[0.1284446578136515, -0.2164089146507654, 0.04443306058363852, 0.3306010137290167]$

EJERCICIO 3 primero programamos el método de Doolittle, y luego lo adaptamos para el método de Crout

$\longrightarrow$ A:matrix([3,6,9],[1,4,11],[0,4,19]);

(A) $$\begin{pmatrix}3 & 6 & 9\\ 1 & 4 & 11\\ 0 & 4 & 19\end{pmatrix}$$

$\longrightarrow$ b:[1/2, -2/3, -3/4];

(b) $$[\frac{1}{2}, -\frac{2}{3}, -\frac{3}{4}]$$

$\longrightarrow$ N:matrix_size(A)[1];

(N) $$3$$

$\longrightarrow$ l:ident(N);

(l) $$\begin{pmatrix}1 & 0 & 0\\ 0 & 1 & 0\\ 0 & 0 & 1\end{pmatrix}$$

$\longrightarrow$ u:ident(N);

(u) $$\begin{pmatrix}1 & 0 & 0\\ 0 & 1 & 0\\ 0 & 0 & 1\end{pmatrix}$$

$\longrightarrow$ for i:1 thru N do(for j:i thru N do u[i, j]:transpose(A)[i,j]-sum(l[i,k]*u[k,j], k, 1, i-1),for j:i+1 thru N do l[j, i]:1/u[i,i]*(transpose(A)[j,i]-sum(l[j,k]*u[k, i], k, 1, i-1)));

(% o7) $$done$$

$\longrightarrow$ l;

(% o8) $$\begin{pmatrix}1 & 0 & 0\\ 2 & 1 & 0\\ 3 & 4 & 1\end{pmatrix}$$

$\longrightarrow$ u;

(% o9) $$\begin{pmatrix}3 & 1 & 0\\ 0 & 2 & 4\\ 0 & 0 & 3\end{pmatrix}$$

$\longrightarrow$ aux:u;

(aux) $$\begin{pmatrix}3 & 1 & 0\\0 & 2 & 4\\0 & 0 & 3\end{pmatrix}$$

$\longrightarrow$ u:transpose(l);

(u) $$\begin{pmatrix}1 & 2 & 3\\0 & 1 & 4\\0 & 0 & 1\end{pmatrix}$$

$\longrightarrow$ l:transpose(aux);

(l) $$\begin{pmatrix}3 & 0 & 0\\1 & 2 & 0\\0 & 4 & 3\end{pmatrix}$$

resolvemos ahora el sistema l.y=b

$\longrightarrow$ y:makelist(0, i, 1, N);

(y) $$[0, 0, 0]$$

$\longrightarrow$ y[1]:b[1]/l[1,1];

(y[1]) $$\frac{1}{6}$$

$\longrightarrow$ for i:2 thru N do y[i]:1/l[i, i]*(b[i]-sum(l[i, j]*y[j], j, 1, i-1));

(% o18) $$done$$

$\longrightarrow$ y;

(% o19) $$[\frac{1}{6}, -\frac{5}{12}, \frac{11}{36}]$$

$\longrightarrow$ x:makelist(0, i, 1, N);

(x) $$[0, 0, 0]$$

ahora resolvemos Ux=y

$\longrightarrow$ x[N]:y[N]/u[N, N];

(x[N]) $$\frac{11}{36}$$

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⟶ for i:N-1 thru 1 step -1 do x[i]:1/u[i,i]*(y[i] - apply("+", makelist(u[i, j]*x[j], j, i+1, N)));
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(% o26) $$done$$

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⟶ x;
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(% o27) $$[\frac{91}{36}, -\frac{59}{36}, \frac{11}{36}]$$

EJERCICIO 4

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⟶ x0:[1,-1.34,1.456];
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(x0) $$[1, -1.34, 1.456]$$

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⟶ A:matrix([3,-2,0.25],[2,9,-5],[2,3,-6]);
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(A) $$\begin{pmatrix} 3 & -2 & 0.25 \\ 2 & 9 & -5 \\ 2 & 3 & -6 \end{pmatrix}$$

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⟶ n:matrix_size(A)[1];
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(n) $$3$$

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⟶ b:[1.1,2.2,3.3];
```

(b) $$[1.1, 2.2, 3.3]$$

```
⟶ N:matrix_size(A)[1];
```

(N) $$3$$

```
⟶ D:ident(N);
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(D) $$\begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix}$$

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⟶ E: genmatrix(lambda([i,j], 0), N, N);
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(E) $$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$$

$\longrightarrow$ F: genmatrix(lambda([i,j], 0), N, N);

(F) $$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$$

$\longrightarrow$ for i:1 thru N do D[i,i]:A[i,i];

(% o10) *done*

$\longrightarrow$ for i:1 thru N-1 do (for j: i+1 thru N do F[i, j]:-A[i,j]);

(% o11) *done*

$\longrightarrow$ for i:2 thru N do (for j:1 thru i-1 do E[i, j]:-A[i,j]);

(% o12) *done*

- Jacobi

$\longrightarrow$ M:D;

(M) $$\begin{pmatrix} 3 & 0 & 0 \\ 0 & 9 & 0 \\ 0 & 0 & -6 \end{pmatrix}$$

$\longrightarrow$ N:E+F;

(N) $$\begin{pmatrix} 0 & 2 & -0.25 \\ -2 & 0 & 5 \\ -2 & -3 & 0 \end{pmatrix}$$

$\longrightarrow$ B:invert(M).N;

(B) $$\begin{pmatrix} 0 & \frac{2}{3} & -0.08333333333333333 \\ -\frac{2}{9} & 0 & 0.5555555555555556 \\ \frac{1}{3} & \frac{1}{2} & 0.0 \end{pmatrix}$$

$\longrightarrow$ c:invert(M).b;

(c) $$\begin{pmatrix} 0.3666666666666667 \\ 0.2444444444444444 \\ -0.5499999999999999 \end{pmatrix}$$

$\longrightarrow$ anterior:x0;

(anterior) $[1, -1.34, 1.456]$

$\longrightarrow$ x:makelist(0, i, 1, n);

(x) $[0, 0, 0]$

$\longrightarrow$ for i:1 thru 15 do (aux:x, for j:1 thru n do x[j]:1/A[j, j]*(b[j]-sum(A[j, k]*anterior[k],k, 1,n) + A[j, j]*anterior[j]), anterior:aux);

(% o19) *done*

$\longrightarrow$ x;

(% o20) $[0.3393137090792436, -0.1020165630555549, -0.4879037118346961]$

- Gauss-Seidel

$\longrightarrow$ M:D-E;

(M) $$\begin{pmatrix} 3 & 0 & 0 \\ 2 & 9 & 0 \\ 2 & 3 & -6 \end{pmatrix}$$

$\longrightarrow$ N:F;

(N) $$\begin{pmatrix} 0 & 2 & -0.25 \\ 0 & 0 & 5 \\ 0 & 0 & 0 \end{pmatrix}$$

$\longrightarrow$ B:invert(M).N;

(B) $$\begin{pmatrix} 0 & \frac{2}{3} & -0.08333333333333333 \\ 0 & -\frac{4}{27} & 0.5740740740740741 \\ 0 & \frac{4}{27} & 0.2592592592592593 \end{pmatrix}$$

$\longrightarrow$ x:makelist(0, i, 1, n);

(x) $[0, 0, 0]$

$\longrightarrow$ anterior:x0;

(anterior) $[1, -1.34, 1.456]$

```
→   for i:1 thru 15 do (aux:x, for j:1 thru n do x[j]:1/A[j, j]*(b[j]-sum(A[j, k]*x[k],
    k, 1, j-1) - sum(A[j, k]*anterior[k], k, j+1, n)), anterior:aux);
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(% o30) $done$

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→   float(x);
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(% o31) $[0.3393174570092825, -0.102013966967479, -0.4879011644806453]$