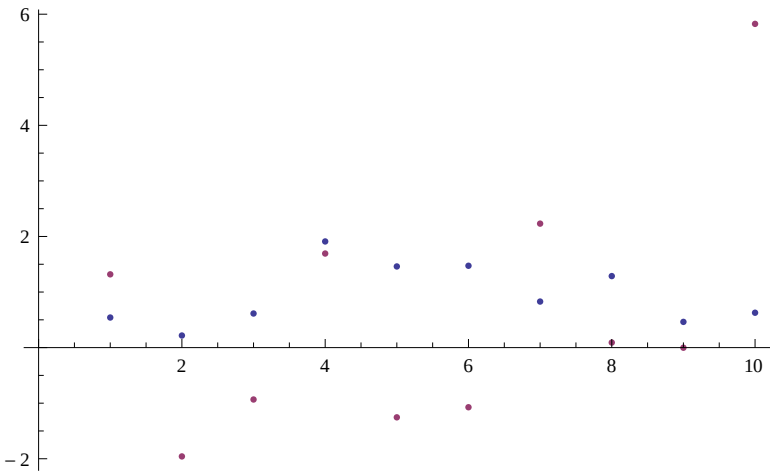
```
CheckSuffMProperty[A0_] := Module[{A = A0, B = A0 - DiagonalMatrix[Diagonal[A0]], M = 1},
  If[Total[UnitStep[-Diagonal[A]]] > 0, M = 0; Print["Diagonal <= 0"]];
  If[Total[1 - UnitStep[-Flatten[B]]] > 0, M = 0; Print["Off-Diagonal > 0"]];
  If[Total[Tally[Sign[Total[Transpose[A]]]]][[1]] ≠ 1 &&
    Total[Tally[Sign[Total[A]]]][[1]], M = 0; Print["Not Diagonally Dominant"]];
  M
 ]

LCPiterate[M0_, q0_, x0_, t0_, norm0_, LCPsolver_] := (*Iterative LCP Solver*)
  Module[{M = M0, q = q0, n = Length[x0], norm = norm0, x = x0,
    tol = t0, notDone = True, d = M0.x0 - q0, LCP = LCPsolver, i, xm = 0},

   While[notDone || Min[d] < -tol xm || Min[x] < -tol xm,
    Print["LCP iteration"];
    Print[Timing[x = LCPsolver[M, q, d, x];][[1]]];

    (*Check for termination*)
    d = M.x - q;
    xm = Norm[x, norm];
    i = 1; notDone = False;
    While[! notDone && i ≤ n,
     notDone = Abs[d[[i]]] > tol xm && Abs[x[[i]]] > tol xm ;
     (*If[notDone,Print[Min[Abs[d[[i]]]/bm,Abs[x[[i]]-c[[i]]]/ cm]]];*)
     i++
    ]

    (*Print[{Min[d]/bm,Min[x-c]/cm}];*)

   ];
   x
   (*ListLinePlot[{M.x-q,x}]*)
  ];
```

```
PIM[M0_, q0_, d0_, x0_] := (*Policy Iteration Method*)
  Module[{M = M0, q = q0, d = d0, x = x0, n = Length[x0], i, k},

   d -= x;

   Print[Timing[
      (*Construct the Matrix for the current iteration*)
      For[i = 1, i ≤ n, i++,
        If[d[[i]] ≥ 0,
          For[k = 1, k ≤ n, k++,
           M[[i, k]] = KroneckerDelta[i, k];
          ];
          q[[i]] = 0
         ];
       ];][[1]]];
   Print[Timing[x = LinearSolve[M, q];][[1]]];
   x
  ];
(*Generation of a some random M-Matrix*)
n = 10;
b = Join[{0}, -RandomReal[10, n - 1]];
c = Join[-RandomReal[10, n - 1], {0}];
a = -b - c + (Max[0, #] & /@ (5 * (RandomReal[1, n] - 0.6))^2);
```

```
M1 = SparseArray[{{i_, i_} :> a[[i]],
    {i_, j_} /; i - j == 1 :> b[[i]], {i_, j_} /; j - i == 1 :> c[[i]]}, {n, n}];
M2 = SparseArray[{{i_, i_} -> 2.1, {i_, j_} /; i - j == -1 -> -1.0,
    {i_, j_} /; i - j == -1 -> -1.01}, {n, n}];
CheckSuffMProperty[M1]
CheckSuffMProperty[M2]
x = RandomReal[2, n]; q = Table[N[2 Sin[20 i / n] + PolyLog[0, 2 (i - 1) / n - 1]], {i, n}];
ListPlot[{x, q}]
```

```
1
```

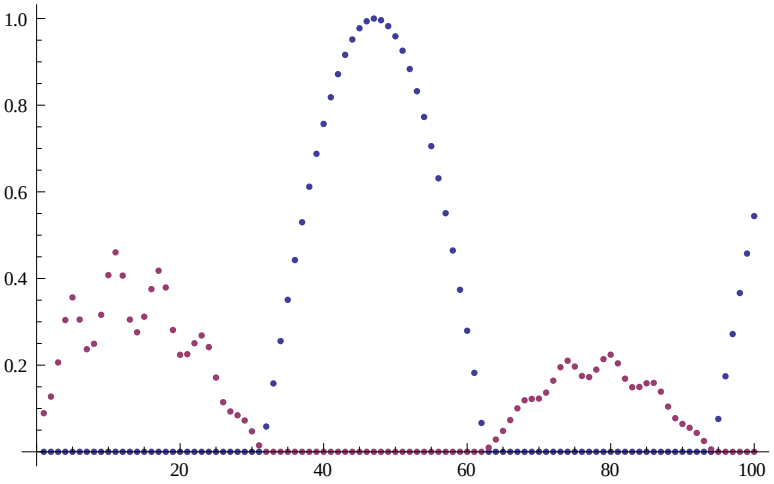
```
1
```




```
n = 100; q = Table[Sin[0.1 i], {i, n}]; z = Table[0.005 i, {i, n}];
M2 = SparseArray[{{i_, i_} -> i^0.3 * 2.0,
   {i_, j_} /; i - j == -1 -> -0.5 j^0.3, {i_, j_} /; i - j == 1 -> -0.5 + 0.9 Sin[i]}, {n, n}];
```

```
$Aborted
```

```
ListPlot[{M2.a2 - q, a2}, PlotRange -> All]
```




```
a2 = LCPiterate[M2, q, z, 10^-15, Infinity, PIM]; a2[[1 ;; Min[n, 100]]]
```

```
LCP iteration
0.047
0.
0.047
LCP iteration
0.031
0.
0.031
```

```
{0.0891247, 0.127387, 0.206228, 0.304068, 0.356352, 0.305145, 0.236776, 0.249314,
 0.316122, 0.407697, 0.460383, 0.406635, 0.305151, 0.275756, 0.311821, 0.375463,
 0.417935, 0.379243, 0.281051, 0.223842, 0.225313, 0.250573, 0.268422, 0.241562,
 0.171369, 0.114525, 0.0931236, 0.0843046, 0.0723399, 0.0472598, 0.0147051,
 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0.,
 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0.00955177, 0.0283699, 0.048115,
 0.0731036, 0.100327, 0.118832, 0.122094, 0.122773, 0.136593, 0.164166, 0.195272,
 0.210159, 0.196779, 0.174995, 0.172334, 0.189669, 0.213902, 0.224131, 0.204092,
 0.168727, 0.149038, 0.149628, 0.158176, 0.15899, 0.138785, 0.104272, 0.0775718,
 0.0642821, 0.0555079, 0.043539, 0.0249099, 0.00546702, 0., 0., 0., 0., 0., 0.}
```

```
LCPiterate[M0_, a0_, b0_, c0_, q0_, x0_, t0_, norm0_, LCPsolver_] :=
  (*Iterative MTA Solver*)
  Module[{M = M0, a = a0, b = b0, c = c0, q = q0, n = Length[x0], norm = norm0,
    x = x0, tol = t0, notDone = True, d = M0.x0 - q0, LCP = LCPsolver, i, xm = 0},

   While[notDone || Min[d] < -tol xm || Min[x] < -tol xm,
    Print["LCP iteration"];
    Print[Timing[x = LCPsolver[a, b, c, q, x];][[1]]];

    (*Check for termination*)
    d = M.x - q;
    xm = Norm[x, norm];
    i = 1; notDone = False;
    While[! notDone && i ≤ n,
     notDone = Abs[d[[i]]] > tol xm && Abs[x[[i]]] > tol xm ;
     (*If[notDone,Print[Min[Abs[d[[i]]]/bm,Abs[x[[i]]-c[[i]]]/ cm]]];*)
     i++
    ]

    (*Print[{Min[d]/bm,Min[x-c]/cm}];*)

   ];
   ListLinePlot[{M.x - q, x}]
  ];
```

```
MTA[a0_, b0_, c0_, q0_, x0_] := (*MODIFIED_THOMAS_ALGORITHM*)
 Module[{β = a0, α = b0, γ = c0, b = q0, x = x0, n = Length[x0], i, k, λ},

  If[x[[1]] (β[[1]] - 1) + x[[2]] γ[[1]] ≥ 0, β[[i]] = 1; γ[[i]] = 0; b[[i]] = 0];

  For[i = 2, i ≤ n, i++,
   If[x[[i - 1]] α[[i]] + x[[i]] (β[[i]] - 1) + x[[i + 1]] γ[[i]] < 0,
    λ = α[[i]] / β[[i - 1]];
    β[[i]] -= λ γ[[i - 1]];
    b[[i]] -= λ b[[i - 1]],
    β[[i]] = 1; γ[[i]] = 0; b[[i]] = 0
   ]];
  x[[n]] = q[[n]] / a[[n]];
  For[i = 1, i < n, i++, x[[i]] = (q[[i]] - c[[i]] x[[i + 1]]) / a[[i]]];
 ]
```