JACOBI'S ITERATIVE METHOD

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RESUME

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DESCRIPTION OF THE PROBLEM

- 8×8 matrix A with elements $A_{ij} = 9$ if $i = j$, and $A_{ij} = 1$ otherwise
- $b = (1, 3, 1, 3, 1, 3, 1, 3)^T$
- difference between Ax_k and b for first 10 steps of the method

DECLARATION OF VARIABLES

- In practice are data relocated to get max on diagonal

```
 9 -    grid on;
10 -    hold on;
11      %Base matrix
12 -    A = ones(8,8);
13 -    for k=1:8
14 -        for j=1:8
15 -        if(k==j)A(k,j) = 9; % diagonal number = 9
16 -        end;
17 -    end;
18 -    end;
19 -    b = [1, 3, 1, 3, 1, 3, 1, 3]'; %right side
20
```

JACOBI METHOD

```
17      %Jacobi method code:
18 -    x0 = zeros(8,1); %start aproximamation //INITIAL APPROXIMATION
19 -    D = diag(A); %diagonal selection
20 -    D = diag(D); %insert diagonal to matrix
21 -    LplusU = A-D; %base matrix without diagonal
22 -    normJ = zeros(1,40);
```

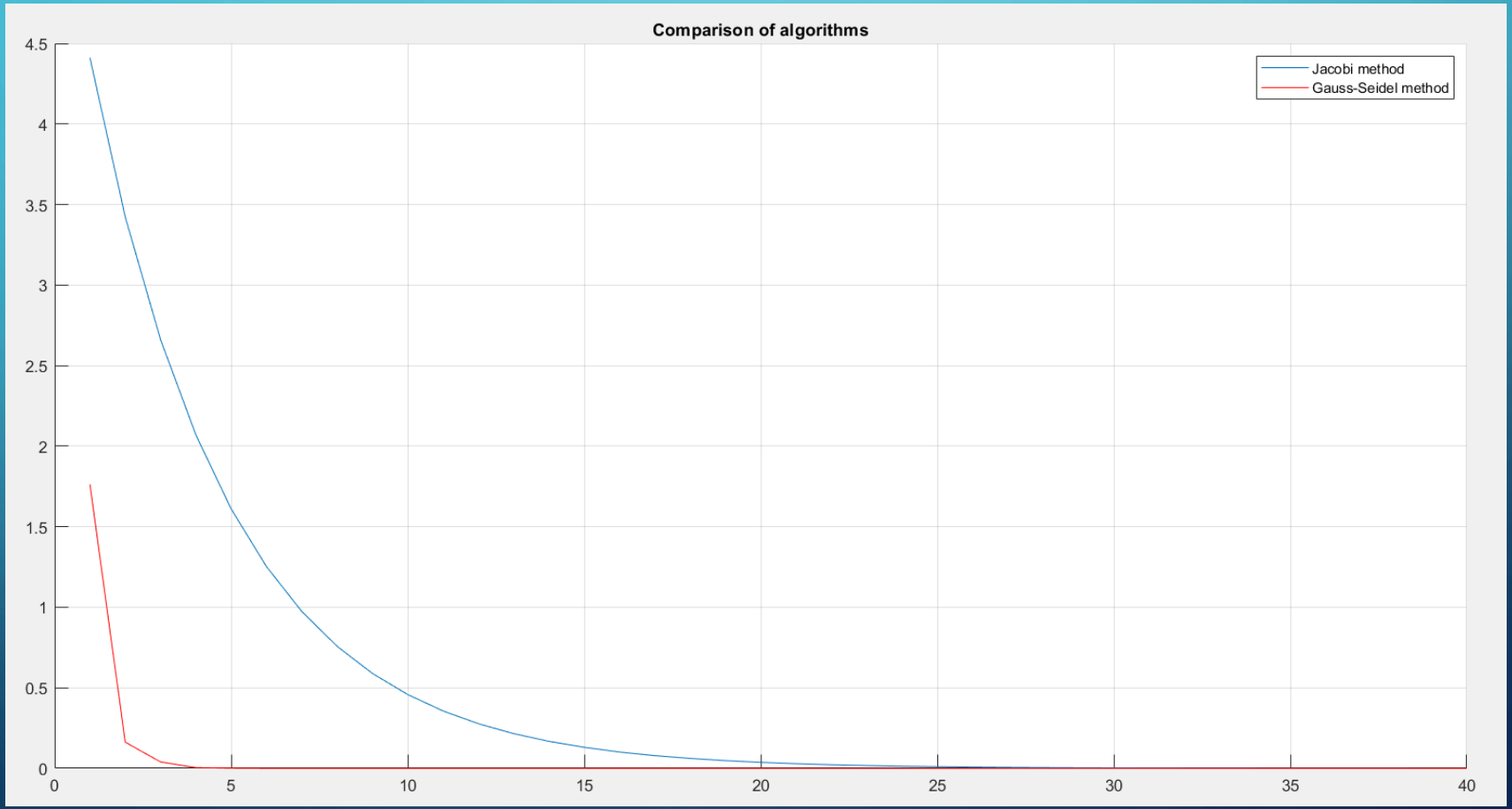
JACOBI METHOD

```
28 -    for k=1:40
29 -        x1 = inv(D)*(b-LplusU*x0);
30 -        normJ(k) = norm(A*x1-b);
31 -        disp(['Difference between Axk and b after ', num2str((k)), ' step(s): ',num2str((normJ(k)))]);
32 -        if(norm(x1-x0)<1e-5) break;end;
33 -        x0 = x1;
34 -    end;
35 -    disp('Result of this method: ')
36 -    x1
37 -    disp(['Jacobi method number of steps  = ', num2str(k)]);
```

FIRST TEN STEPS

```
Difference between Axk and b after 1 step(s): 4.411
Difference between Axk and b after 2 step(s): 3.4222
Difference between Axk and b after 3 step(s): 2.6616
Difference between Axk and b after 4 step(s): 2.0701
Difference between Axk and b after 5 step(s): 1.6101
Difference between Axk and b after 6 step(s): 1.2523
Difference between Axk and b after 7 step(s): 0.97401
Difference between Axk and b after 8 step(s): 0.75756
Difference between Axk and b after 9 step(s): 0.58922
Difference between Axk and b after 10 step(s): 0.45828
```

JACOBI VS GAUSS



FAILURE

- If the absolute value of line is bigger than value on diagonal the algorithm is not working

```
 8
 9 -   for k=1:8
10 -       for j=1:8
11 -       if(k==j)A(k,j) = 0.1; % diagonal number = 0.1
12 -       end;
13 -   end;
14 -   end;
15 -    b = [1, 3, 1, 3, 1, 3, 1, 3]'; %right side
```

FAILURE FIRST TEN STEPS

```
Difference between Axk and b after 1 step(s): 1984.9433
Difference between Axk and b after 2 step(s): 693000.7215
Difference between Axk and b after 3 step(s): 242537883.6388
Difference between Axk and b after 4 step(s): 84888170922.102
Difference between Axk and b after 5 step(s): 29710859191653.31
Difference between Axk and b after 6 step(s): 1.039880071257093e+16
Difference between Axk and b after 7 step(s): 3.639580249367626e+18
Difference between Axk and b after 8 step(s): 1.273853087278439e+21
Difference between Axk and b after 9 step(s): 4.458485805474521e+23
Difference between Axk and b after 10 step(s): 1.560470031916082e+26
Difference between Axk and b after 11 step(s): 5.461645111706288e+28
Difference between Axk and b after 12 step(s): 1.9115757890972e+31
Difference between Axk and b after 13 step(s): 6.690515261840201e+33
Difference between Axk and b after 14 step(s): 2.341680341644071e+36
Difference between Axk and b after 15 step(s): 8.195881195754248e+38
```

THANK YOU FOR YOUR ATTENTION