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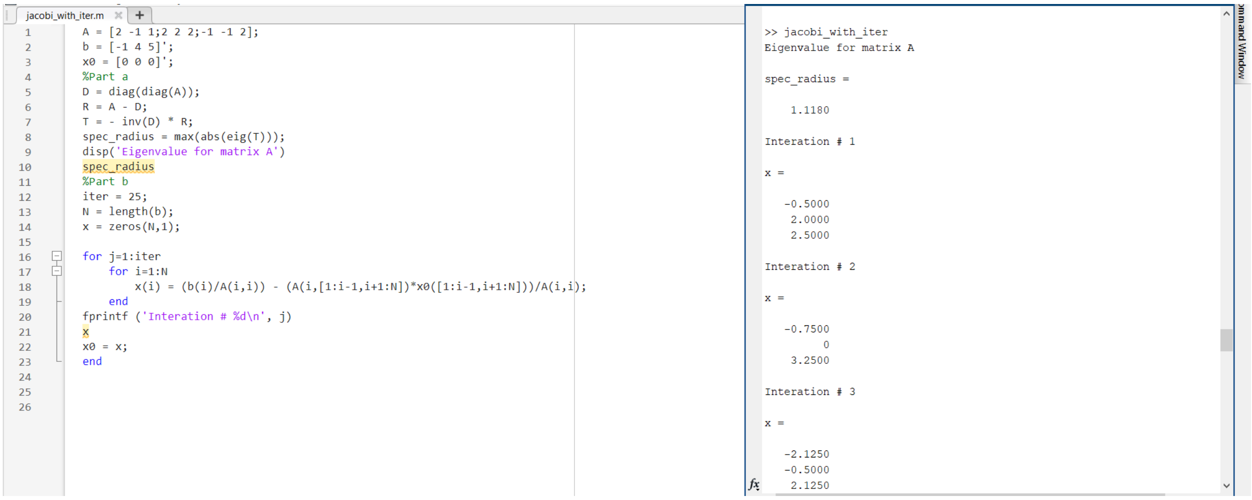
MATH434

HW3

#3

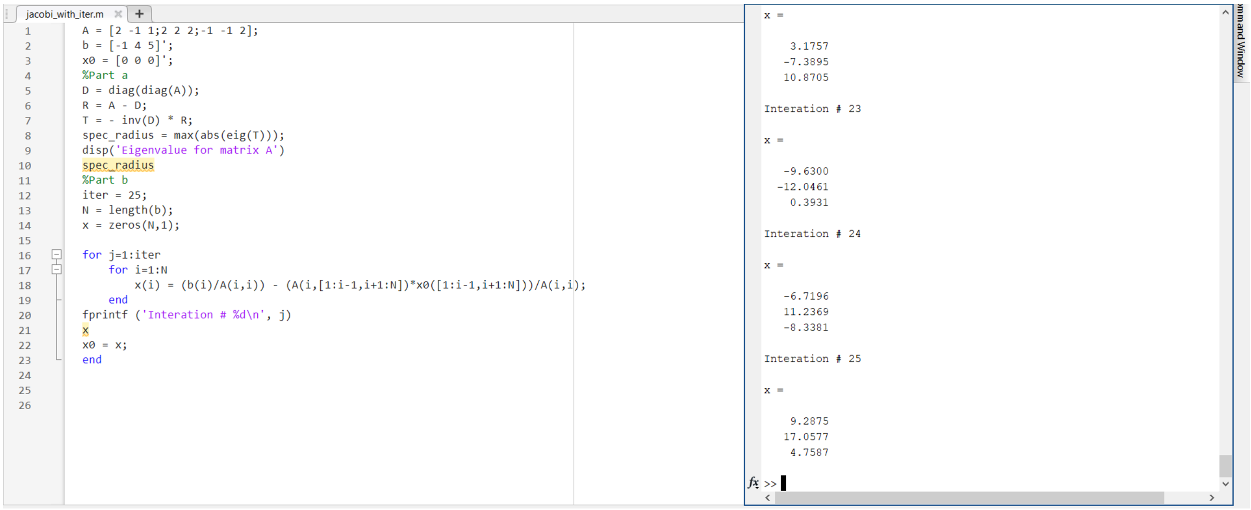
a.



```
A = [2 -1 1;2 2 2;-1 -1 2];
b = [-1 4 5]';
x0 = [0 0 0]';
%Part a
D = diag(diag(A));
R = A - D;
T = - inv(D) * R;
spec_radius = max(abs(eig(T)));
disp('Eigenvalue for matrix A')
spec_radius
%Part b
iter = 25;
N = length(b);
x = zeros(N,1);

for j=1:iter
    for i=1:N
        x(i) = (b(i)/A(i,i)) - (A(i,[1:i-1,i+1:N])*x0([1:i-1,i+1:N]))/A(i,i);
    end
fprintf ('Interation # %d\n', j)
x
x0 = x;
end
```

```
>> jacobi_with_iter
Eigenvalue for matrix A

spec_radius =

    1.1180

Interation # 1

x =

   -0.5000
    2.0000
    2.5000

Interation # 2

x =

   -0.7500
         0
    3.2500

Interation # 3

x =

   -2.1250
   -0.5000
    2.1250
```

b.

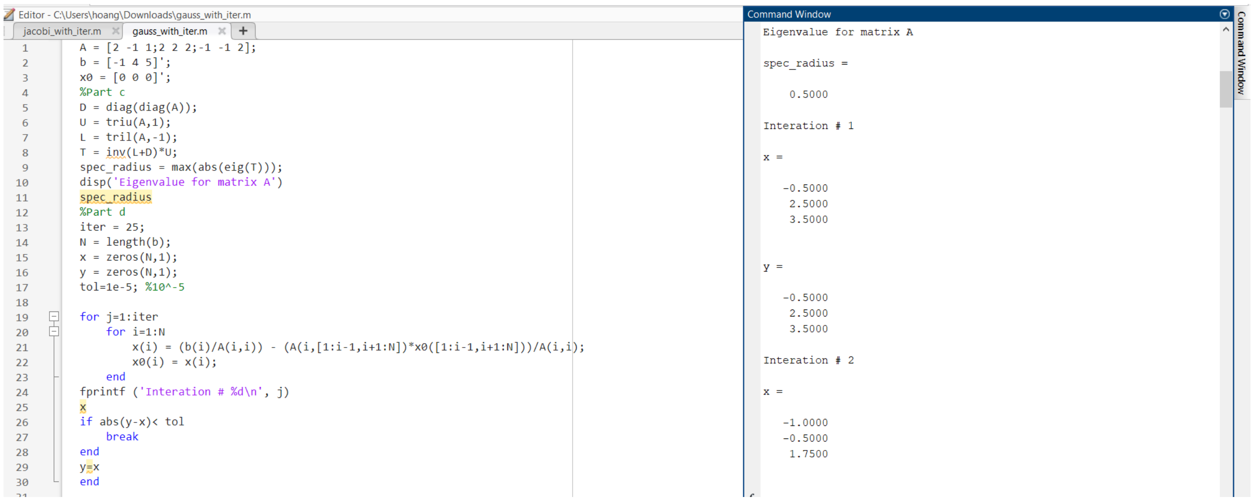


```
A = [2 -1 1;2 2 2;-1 -1 2];
b = [-1 4 5]';
x0 = [0 0 0]';
%Part a
D = diag(diag(A));
R = A - D;
T = - inv(D) * R;
spec_radius = max(abs(eig(T)));
disp('Eigenvalue for matrix A')
spec_radius
%Part b
iter = 25;
N = length(b);
x = zeros(N,1);

for j=1:iter
    for i=1:N
        x(i) = (b(i)/A(i,i)) - (A(i,[1:i-1,i+1:N])*x0([1:i-1,i+1:N]))/A(i,i);
    end
fprintf ('Interation # %d\n', j)
x
x0 = x;
end
```

```
x =

    3.1757
   -7.3895
   10.8705

Interation # 23

x =

   -9.6300
  -12.0461
    0.3931

Interation # 24

x =

   -6.7196
   11.2369
   -8.3381

Interation # 25

x =

    9.2875
   17.0577
    4.7587

>>
```

After 25 iterations, Jacobi method fail. The approximate solution is far away from the exact solution.

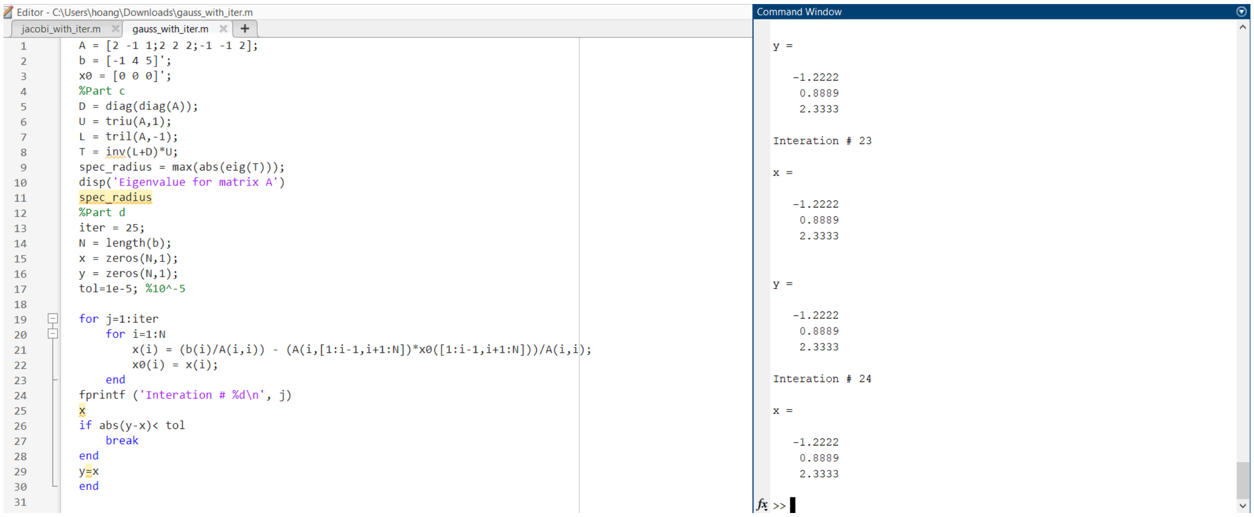
c.



```
A = [2 -1 1;2 2 2;-1 -1 2];
b = [-1 4 5]';
x0 = [0 0 0]';
%Part c
D = diag(diag(A));
U = triu(A,1);
L = tril(A,-1);
T = inv(L+D)*U;
spec_radius = max(abs(eig(T)));
disp('Eigenvalue for matrix A')
spec_radius
%Part d
iter = 25;
N = length(b);
x = zeros(N,1);
y = zeros(N,1);
tol=1e-5; %10^-5

for j=1:iter
    for i=1:N
        x(i) = (b(i)/A(i,i)) - (A(i,[1:i-1,i+1:N])*x0([1:i-1,i+1:N]))/A(i,i);
        x0(i) = x(i);
    end
fprintf ('Interation # %d\n', j)
x
if abs(y-x)< tol
    break
end
y=x
end
```

```
Eigenvalue for matrix A

spec_radius =

    0.5000

Interation # 1

x =

  -0.5000
   2.5000
   3.5000


y =

  -0.5000
   2.5000
   3.5000

Interation # 2

x =

  -1.0000
  -0.5000
   1.7500
```

d.



```
A = [2 -1 1;2 2 2;-1 -1 2];
b = [-1 4 5]';
x0 = [0 0 0]';
%Part c
D = diag(diag(A));
U = triu(A,1);
L = tril(A,-1);
T = inv(L+D)*U;
spec_radius = max(abs(eig(T)));
disp('Eigenvalue for matrix A')
spec_radius
%Part d
iter = 25;
N = length(b);
x = zeros(N,1);
y = zeros(N,1);
tol=1e-5; %10^-5

for j=1:iter
    for i=1:N
        x(i) = (b(i)/A(i,i)) - (A(i,[1:i-1,i+1:N])*x0([1:i-1,i+1:N]))/A(i,i);
        x0(i) = x(i);
    end
fprintf ('Interation # %d\n', j)
x
if abs(y-x)< tol
    break
end
y=x
end
```

```
y =

  -1.2222
   0.8889
   2.3333

Interation # 23

x =

  -1.2222
   0.8889
   2.3333


y =

  -1.2222
   0.8889
   2.3333

Interation # 24

x =

  -1.2222
   0.8889
   2.3333

fx >>
```

I’m not sure want you mean by within 10^-5 in l infinity norm.