```
clc
clear all
```

```
A = zeros(100);
%B = zeros(100);
U = rand(100,100);
I = zeros(100);


for i = 1:size(A,1)

    for j = 1:size(A,2)

        if(i == j)

            A(i,j) = 2;
            I(i,j) = 1;

        elseif(j == i+1)
            A(i,j) = -1;

        elseif(i == j+1)
            A(i,j) = -1;
        end

    end

end

B = I + (1/100)*U;


a = eig(A);
b = eig(B);

real_a = real(a);
imag_a = imag(a);

real_b = real(b);
imag_b = imag(b);



figure(1)
plot(a)
hold on
plot(b)
hold off
title('part i')


% Power Iteration

v0 = zeros(100,1);

v0(1,1) = 1/sqrt(2);

v0(34,1) = 1/sqrt(2);


tol = 0.0001;


n = 1;

V(:,1) = v0;

LambdaA(1) = v0'*A*v0;

ErrorPA(1) = abs(LambdaA(1) - max(a))/max(a);

del = abs(LambdaA(1) - max(a));


while del > tol

    w = A*V(:,n);

    normw = sqrt(w'*w);

    n = n+1;

    V(:,n) = w/normw;

    LambdaA(n) = V(:,n)' * A * V(:,n);

    del = abs(LambdaA(n) - max(a));

    ErrorPA(n) = del/max(a);
end

NA =n

for i = 1:NA

    Na(i) = i;
end

n = 1;

LambdaB(1) = v0'*B*v0;

ErrorPB(1) = abs(LambdaB(1) - max(b))/max(b);

del = abs(LambdaB(1) - max(b));


while del > tol

    w = B*V(:,n);

    normw = sqrt(w'*w);

    n = n+1;

    V(:,n) = w/normw;

    LambdaB(n) = V(:,n)' * B * V(:,n);

    del = abs(LambdaB(n) - max(b));

    ErrorPB(n) = del/max(b);
end

NB = n

for i = 1:NB

    Nb(i) = i;
end




figure(2)
loglog(Na,ErrorPA)
hold on
loglog(Nb, ErrorPB)
title('Power Iteration Error: Tolerance = 0.0001')
legend('Error on A','Error on B')



% Inverse Iteration

muA = 3.999;

muB = 1.45;


n = 1;

V(:,1) = v0;

LambdaA(1) = v0'*A*v0;

ErrorPA(1) = abs(LambdaA(1) - max(a))/max(a);

del = abs(LambdaA(1) - max(a));

while del > tol

    w = (A - muA*I)\V(:,n);

    normw = sqrt(w'*w);

    n = n+1;

    V(:,n) = w/normw;

    LambdaA(n) = V(:,n)' * A * V(:,n);

    del = abs(LambdaA(n) - max(a));

    ErrorPA(n) = del/max(a);

end

NA = n

for i = 1:NA

    Na(i) = i;
end

n = 1;

V(:,1) = v0;

LambdaB(1) = v0'*B*v0;

ErrorPB(1) = abs(LambdaB(1) - max(b))/max(b);

del = abs(LambdaB(1) - max(b));

while del > tol

    w = (B - muB*I)\V(:,n);

    normw = sqrt(w'*w);

    n = n+1;

    V(:,n) = w/normw;

    LambdaB(n) = V(:,n)' * B * V(:,n);

    del = abs(LambdaB(n) - max(b));

    ErrorPB(n) = del/max(b);

end

NB = n

for i = 1:NB

    Nb(i) = i;
end

figure(3)
loglog(Na,ErrorPA)
hold on
loglog(Nb, ErrorPB)
title('Inverse Iteration Error: Tolerance = 0.0001')
legend('Error on A','Error on B')
```

```
NA =

        2219


NB =

    17


NA =

     2


NB =

     4
```