Table of Contents


```
% Joshua Oates HW8
```

section 0 - clean up

```
clear all;
close all;
clc
```

section 1

```
A=[[-1,0,3,2];[0,2,-1,-3,];[3,-1,1,0];[2,-3,0,2]];
[V1,D1]=eig(A)


i = 1;
[V2]=NSI(A,100);
err = 1;
i = 2;
while err>.0001
    [V2(:,:,i),p]=NSI(A,i);
    err = max(max(abs(V2(:,:,i)-V2(:,:,i-1))));
    i=i+1;
end
V2 = V2(:,:,end)

disp(i+" iterations are required for an accuracy of .0001")

shouldBeOne = [];
shouldBeZero = [];
for i = 1:4
    for j = 1:4
        if i == j
            shouldBeOne = [shouldBeOne,V2(:,i)'*V2(:,j)];
        else
            shouldBeZero = [shouldBeZero,V2(:,i)'*V2(:,j)];
        end
    end
end

disp("verified if these are one")
disp(shouldBeOne)
disp("verified if these are zero")
```

```
disp(shouldBeZero)

disp("verified that eigenvectors are a basis of R4")
clc
```

```
V1 =

    0.7362    0.3437    0.4756    0.3372
   -0.2696    0.6643    0.3604   -0.5969
   -0.4923   -0.3032    0.7443    0.3343
   -0.3781    0.5905   -0.3001    0.6468


D1 =

   -4.0334         0         0         0
         0   -0.2104         0         0
         0         0    2.4328         0
         0         0         0    5.8110
```

function def

```
function [V, lambda] = NSI(A, n)
%Approximates all the eigenvectors and eigenvalues of a matrix
%   A: real square symmmetric matrix
%   n: number of iterations
%   V: approximation of the eigenvectors
%   lambda: approximation of the eigenvalues
V = eye(size(A));
for i=1:n
    [V, lambda] = qr(A*V);
end
%lambda = diag(lambda); %can comment to see how off-diagonal approach zero
end
```

```
V2 =

   -0.3371   -0.7362   -0.4756    0.3437
    0.5968    0.2696   -0.3604    0.6643
   -0.3343    0.4923   -0.7443   -0.3032
   -0.6468    0.3781    0.3001    0.5905

30 iterations are required for an accuracy of .0001
verified if these are one
    1.0000    1.0000    1.0000    1.0000

verified if these are zero
   1.0e-15 *

  Columns 1 through 7
```

```
   -0.0555   -0.0833    0.0555   -0.0555    0.0555   -0.2220   -0.0833

  Columns 8 through 12

    0.0555   -0.0555    0.0555   -0.2220   -0.0555

verified that eigenvectors are a basis of R4
```

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