***EXPERIMENT1:THEORY AND PROPERTIES OF EIGENVALUE AND EIGENVECTORS***

***DEFINITION OF EIGENVALUE AND EIGENVECTORS:***

A scalar λ is called an eigenvalue of the n × n matrix A is there is a nontrivial solution x of Ax = λx. Such an x is called an eigenvector corresponding to the eigenvalue λ.

PROPERTY 1:

The sum of eigen values of a square matrix is equal to trace of the matrix

PROPERTY 2:

The product of eigen values is equal to the determinant of the square matrix

PROPERTY 3:

If **λ1, λ2, λ3,…… λn** are eigen values of a matrix A then

1. **kλ1,k λ2,k λ3,……** kλnare eigen values of the matrix kA where k is a constant
2. for **λ**!=0 , for all i=1,2,3….n then **1/λ1,1/ λ2,1/ λ3,……** 1/λnare eigen values of the inverse of the matrix A-1
3. **λ1^p, λ2^p, λ3^p,…… λn^p** are eigen values of a matrix A^p, where p is any positive integer
4. A-kI has eigen values **k- λ1,k- λ2,k- λ3,…… k-λn**

PROPERTY 4:

A square matrix A and its transpose A’ have same eigen values

PROPERTY 5:

1)The eigenvalue of real symmetric matrix are real

2)The eigenvalue of skew symmetric matrix are purely imaginary or zero

Let a=[6 2 -2;-2 3 -1; 2 -1 3];

`MATLAB CODE:

EIGENVALUE AND EIGENVECTOR:

clear

clc

a=[6 2 -2;-2 3 -1; 2 -1 3];

disp("EIGENVALUE\n");

e=eig(a)

disp("EIGENVECTOR\n");

[V,D]=eig(a);

disp(V)

EIGENVALUE

e =

   5.0000 + 2.6458i

   5.0000 - 2.6458i

   2.0000 + 0.0000i

EIGENVECTOR

   0.70711 + 0.00000i   0.70711 - 0.00000i  -0.00000 + 0.00000i

  -0.17678 + 0.46771i  -0.17678 - 0.46771i   0.70711 + 0.00000i

   0.17678 - 0.46771i   0.17678 + 0.46771i   0.70711 + 0.00000i

PROPERTY 1:

clear

clc

a=[6 2 -2;-2 3 -1; 2 -1 3];

e=eig(a)

s=sum(e)

t=trace(a)

e =

   5.0000 + 2.6458i

   5.0000 - 2.6458i

   2.0000 + 0.0000i

s =  12

t =  12

PROPERTY 2:

clear

clc

a=[6 2 -2;-2 3 -1; 2 -1 3];

e=eig(a)

p=prod(e)

d=det(a)

e =

   5.0000 + 2.6458i

   5.0000 - 2.6458i

   2.0000 + 0.0000i

p =  64

d =  64

PROPERY 3:

1)

clear

clc

a=[6 2 -2;-2 3 -1; 2 -1 3];

a1=2\*[6 2 -2;-2 3 -1; 2 -1 3];

e=eig(a)

e1=eig(a1)

e =

   5.0000 + 2.6458i

   5.0000 - 2.6458i

   2.0000 + 0.0000i

e1 =

   10.0000 +  5.2915i

   10.0000 -  5.2915i

    4.0000 +  0.0000i

2)

clear

clc

a=[6 2 -2;-2 3 -1; 2 -1 3];

a1=inv(a);

e=eig(a)

e1=eig(a1)

e =

   5.0000 + 2.6458i

   5.0000 - 2.6458i

   2.0000 + 0.0000i

e1 =

   0.15625 + 0.08268i

   0.15625 - 0.08268i

   0.50000 + 0.00000i

3)

clear

clc

a=[6 2 -2;-2 3 -1; 2 -1 3];

a1=a^2;

e=eig(a)

e1=eig(a1)

e =

   5.0000 + 2.6458i

   5.0000 - 2.6458i

   2.0000 + 0.0000i

e1 =

   18.0000 + 26.4575i

   18.0000 - 26.4575i

    4.0000 +  0.0000i

4)

clear

clc

a=[6 2 -2;-2 3 -1; 2 -1 3];

a1=a-2\*eye(3);

e=eig(a)

e1=eig(a1)

e =

   5.0000 + 2.6458i

   5.0000 - 2.6458i

   2.0000 + 0.0000i

e1 =

   3.00000 + 2.64575i

   3.00000 - 2.64575i

   0.00000 + 0.00000i

PROPERTY 4:

clear

clc

a=[6 2 -2;-2 3 -1; 2 -1 3];

a1=a';

e=eig(a)

e1=eig(a1)

e =

   5.0000 + 2.6458i

   5.0000 - 2.6458i

   2.0000 + 0.0000i

e1 =

   5.0000 + 2.6458i

   5.0000 - 2.6458i

   2.0000 + 0.0000i

PROPERTY 5:

1) clc

clear all

a=[1 2 3;2 2 4;3 4 5];

eig(a)

ans =

  -0.78765

  -0.54420

   9.33185

2)

clc

clear all

a=[0 -2 -3;2 0 -4;3 4 0];

eig(a)

ans =

  -0.00000 + 0.00000i

   0.00000 + 5.38516i

   0.00000 - 5.38516i

Let a=[1 3 7;-3 4 -7 ;4 7 -7];

EIGENVALUE AND EIGENVECTOR:

clear

clc

a=[1 3 7;-3 4 -7 ;4 7 -7];

disp("EIGENVALUE\n");

e=eig(a)

disp("EIGENVECTOR\n");

[V,D]=eig(a);

disp(V)

EIGENVALUE

e =

  -8.0562 + 0.0000i

   3.0281 + 6.2145i

   3.0281 - 6.2145i

EIGENVECTOR

   0.64293 + 0.00000i  -0.19749 - 0.59229i  -0.19749 + 0.59229i

  -0.25861 + 0.00000i   0.67671 + 0.00000i   0.67671 - 0.00000i

  -0.72095 + 0.00000i   0.17860 - 0.34693i   0.17860 + 0.34693i

PROPERTY 1:

clear

clc

a=[1 3 7;-3 4 -7 ;4 7 -7];

e=eig(a)

s=sum(e)

t=trace(a)

s = -2.0000

t = -2

PROPERTY 2:

clear

clc

a=[1 3 7;-3 4 -7 ;4 7 -7];

e=eig(a)

p=prod(e)

d=det(a)

e =

  -8.0562 + 0.0000i

   3.0281 + 6.2145i

   3.0281 - 6.2145i

p = -385.00

d = -385

PROPERTY 3:

1)

clear

clc

a=[1 3 7;-3 4 -7 ;4 7 -7];

a1=2\*a;

e=eig(a)

e1=eig(a1) e =

  -8.0562 + 0.0000i

   3.0281 + 6.2145i

   3.0281 - 6.2145i

e1 =

  -16.1123 +  0.0000i

    6.0562 + 12.4290i

    6.0562 - 12.4290i

2)

clear

clc

a=[1 3 7;-3 4 -7 ;4 7 -7];

a1=inv(a);

e=eig(a)

e1=eig(a1) e =

  -8.0562 + 0.0000i

   3.0281 + 6.2145i

   3.0281 - 6.2145i

e1 =

   0.06336 + 0.13004i

   0.06336 - 0.13004i

  -0.12413 + 0.00000i

3)

clear

clc

a=[1 3 7;-3 4 -7 ;4 7 -7];

a1=a^2;

e=eig(a)

e1=eig(a1) e =

  -8.0562 + 0.0000i

   3.0281 + 6.2145i

   3.0281 - 6.2145i

e1 =

  -29.451 + 37.636i

  -29.451 - 37.636i

   64.902 +  0.000i

4)

clear

clc

a=[1 3 7;-3 4 -7 ;4 7 -7];

a1=a-2\*eye(3);

e=eig(a)

e1=eig(a1) e =

  -8.0562 + 0.0000i

   3.0281 + 6.2145i

   3.0281 - 6.2145i

e1 =

  -10.0562 +  0.0000i

    1.0281 +  6.2145i

    1.0281 -  6.2145i

PROPERTY 4:

clear

clc

a=[1 3 7;-3 4 -7 ;4 7 -7];

a1=a';

e=eig(a)

e1=eig(a1) e =

  -8.0562 + 0.0000i

   3.0281 + 6.2145i

   3.0281 - 6.2145i

e1 =

  -8.0562 + 0.0000i

   3.0281 + 6.2145i

   3.0281 - 6.2145i

PROPERTY 5:

1)

clc

clear all

a=[2 5 7;5 3 9;7 9 4];

eig(a)

ans =

   -5.8682

   -2.4156

   17.2838

2)

clc

clear all

a=[0 -5 -7;5 0 -9;7 9 0];

eig(a)

ans =

    0.00000 +  0.00000i

    0.00000 + 12.44990i

    0.00000 - 12.44990i

BY

M.S.SANJAY

15BCE0517

L7+L8