MATLAB ASSIGNMENT
EXP - 6
(POWER METHOD)

Submitted by -
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1. **Algorithm for Power method:**

   (a) Start

   (b) Define matrix A and initial guess x

   (c) Calculate $y = Ax$

   (d) Find the largest element in magnitude of matrix y and assign it to K.

   (e) Calculate fresh value $x = (1/K) * y$

   (f) If $|K(n) - K(n-1)| >$ error, goto step c.

   (g) Stop

2. (a) Determine the largest eigenvalue and the corresponding eigenvector of the matrix

$$\begin{bmatrix} 4 & 1 & 0 \\ 1 & 20 & 1 \\ 0 & 1 & 4 \end{bmatrix}$$

   using the power method. Use $x^0 = [1, 1, 1]^T$ and $\epsilon = 10^{-3}$.

```
A=[4 1 0 ; 1 20 1 ; 0 1 4];
x0=[1;1;1];
y=A*x0;
k=max(y);
x1=y/k;
tol=0.001;
diff=abs(x0-x1);
while max(diff)>tol
    x0=x1;
    y=A*x0;
    k=max(y);
    x1=y/k;
    diff=abs(x0-x1);
end
disp(x1);
disp(k);
```

exp6_2i.m

```
A=[4 1 0 ; 1 20 1 ; 0 1 4];
x0=[1;1;1];
y=A*x0;
k=max(y);
x1=y/k;
tol=0.001;
diff=abs(x0-x1);
while max(diff)>tol
    x0=x1;
    y=A*x0;
    k=max(y);
    x1=y/k;
    diff=abs(x0-x1);
end
disp(x1);
disp(k);
```

COMMAND WINDOW

```
>> EXP6_2a
    0.0622
    1.0000
    0.0622

   20.1264

>>
```

(b) Find the smallest eigenvalue and the corresponding eigenvector of the following matrix by inverse power method.

$$\begin{bmatrix} 1 & 1 & 0 & 0 \\ 1 & 2 & 0 & 1 \\ 0 & 0 & 3 & 3 \\ 0 & 1 & 2 & 3 \end{bmatrix}$$

Use $x^0 = [1, 1, 0, 1]^T$ and $\epsilon = 10^{-3}$.

Solution.

```
a= [1,1,0,0;1,2,0,1;0,0,3,3;0,1,2,3];
m=inv(a);
x0 = [1;1;0;1];
Y=m*x0;
k=max(Y);
x1=(Y/k);
tol=0.001;
while ((min(x1-x0))>tol)||(min(x0-x1)>tol)
    x0=x1;
    Y=m*x0;
    k=max(Y);
    x1=(Y/k);
end
disp(k);
disp(x1);
```

exp6_2i.m | exp6_2ii.m

```
a= [1,1,0,0;1,2,0,1;0,0,3,3;0,1,2,3];
m=inv(a);
x0 = [1;1;0;1];
Y=m*x0;
k=max(Y);
x1=(Y/k);
tol=0.001;
while ((min(x1-x0))>tol)||(min(x0-x1)>tol)
      x0=x1;
      Y=m*x0;
      k=max(Y);
      x1=(Y/k);
end
disp(k);
disp(x1);
```

COMMAND WINDOW

```
>> exp6_2ii
Warning: Matrix is close to singular or badly scaled. Results
> In exp6_2ii (line 2)

   9.0072e+15

     1
    -1
    -1
     1

>>
```