MATLAB ASSIGNMENT-4

EIGEN VALUES AND EIGEN VECTORS

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- ***REG NO.:*** *- 18BCI0173*
- ***SLOT:*** *- L15 +L16*
- ***SESSION:*** *- WINTER SEMESTER 2018-2019*
- ***FACULTY:*** *- PROF. POORNIMA T*

➢ ***DATE:*** *- 9th JANUARY 2019*

Q1. Prove the following statements:

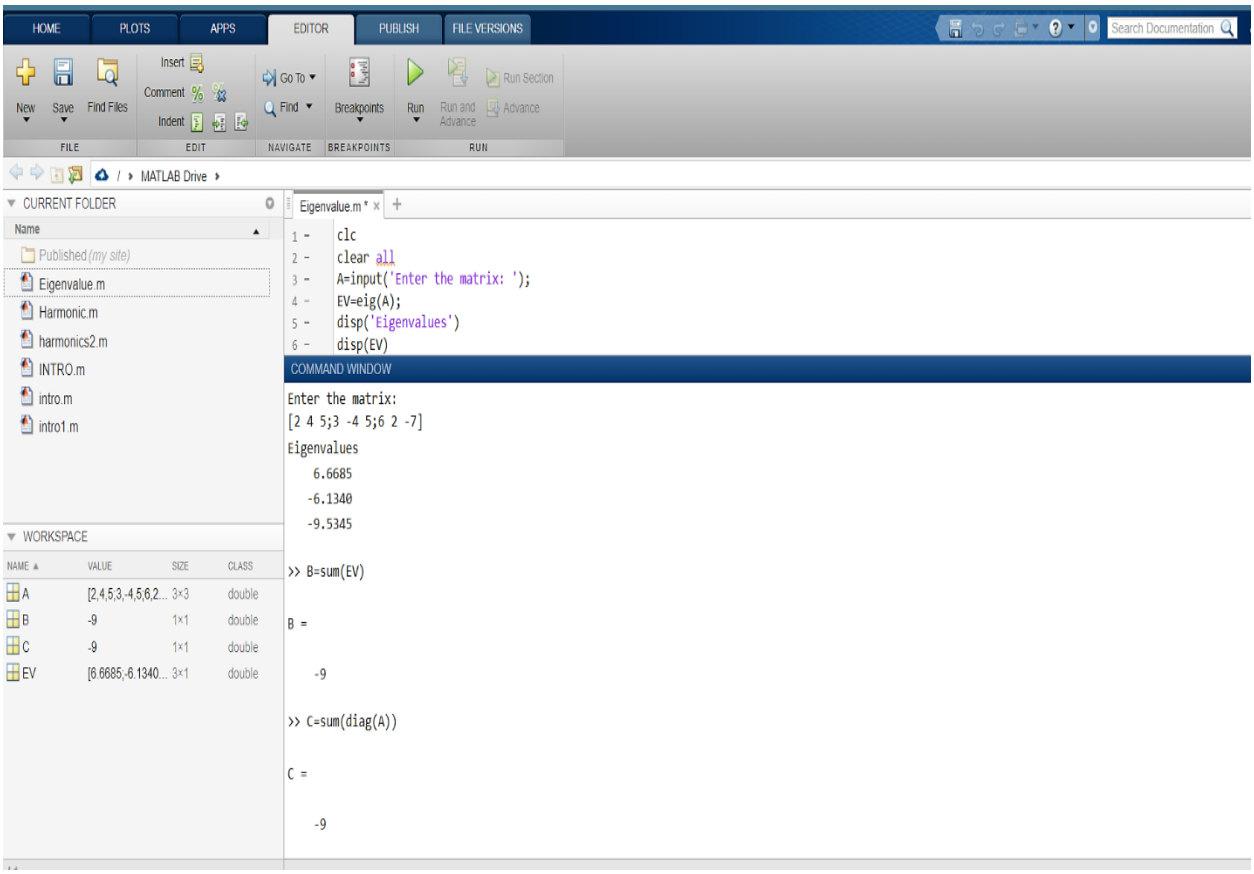
(a) The sum of the eigen values of a matrix is the sum of the elements of the principal diagonal.

(b) If λ is an eigenvalue of a matrix A, then 1/ λ is the eigenvalue of A^{-1}.

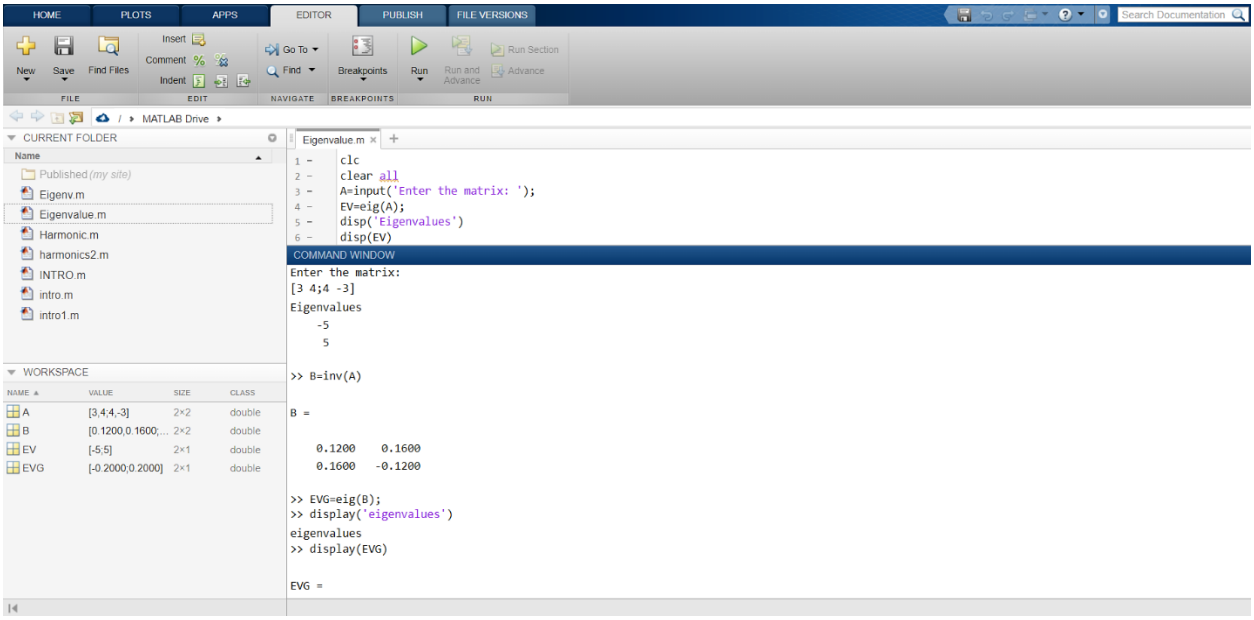
(c) If λ1, λ2, · · ·, λn are the eigenvalues of a matrix, then A^m has the eigenvalues $\lambda^m_1, \lambda^m_2, \cdots, \lambda^m_n$ (m being a positive integer).

Sol: -

(a)



(b)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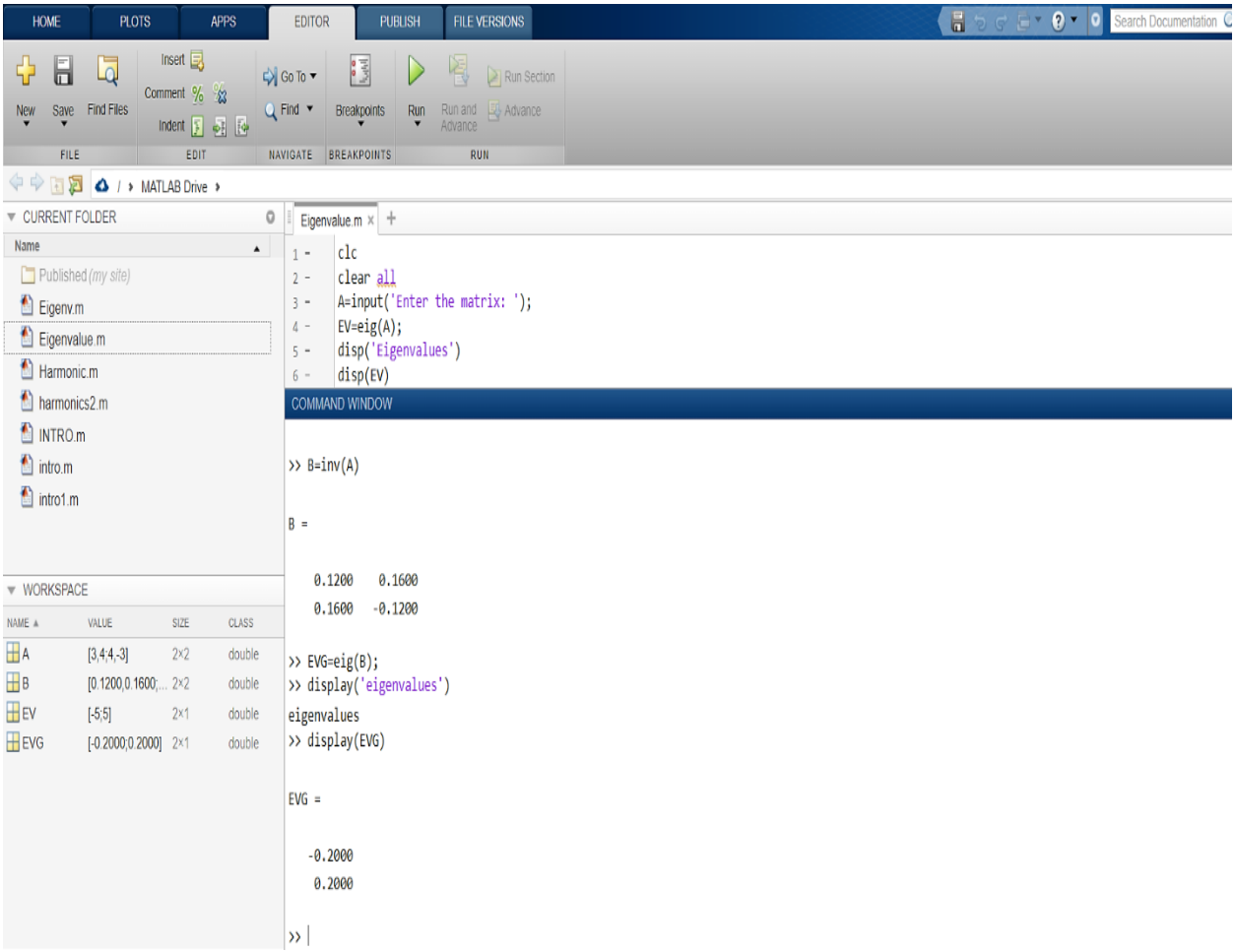
Name
Published (my site)
Eigenv.m
Eigenvalue.m
Harmonic.m
harmonics2.m
INTRO.m
intro.m
intro1.m
WORKSPACE
NAME
VALUE
SIZE
CLASS
A [3,4;4,-3] 2×2 double
B [0.1200,0.1600;... 2×2 double
EV [-5;5] 2×1 double
EVG [-0.2000;0.2000] 2×1 double
Eigenvalue.m
1 - clc
2 - clear all
3 - A=input('Enter the matrix: ');
4 - EV=eig(A);
5 - disp('Eigenvalues')
6 - disp(EV)
COMMAND WINDOW
Enter the matrix:
[3 4;4 -3]
Eigenvalues
-5
5
>> B=inv(A)
B =
0.1200 0.1600
0.1600 -0.1200
>> EVG=eig(B);
>> display('eigenvalues')
eigenvalues
>> display(EVG)
EVG =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Eigenv.m
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WORKSPACE
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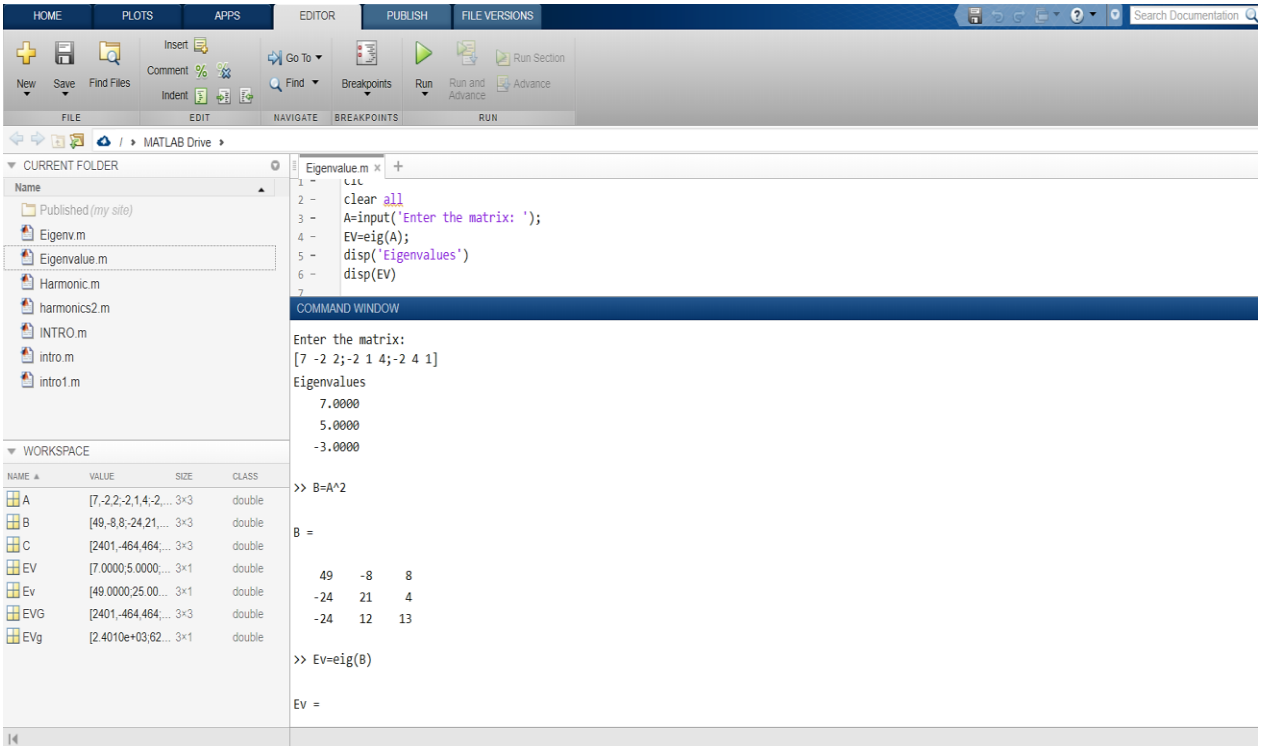
CLASS
A [3,4;4,-3] 2×2 double
B [0.1200,0.1600;... 2×2 double
EV [-5;5] 2×1 double
EVG [-0.2000;0.2000] 2×1 double
Eigenvalue.m
1 - clc
2 - clear all
3 - A=input('Enter the matrix: ');
4 - EV=eig(A);
5 - disp('Eigenvalues')
6 - disp(EV)
COMMAND WINDOW
>> B=inv(A)
B =
0.1200 0.1600
0.1600 -0.1200
>> EVG=eig(B);
>> display('eigenvalues')
eigenvalues
>> display(EVG)
EVG =
-0.2000
0.2000
>>

(c)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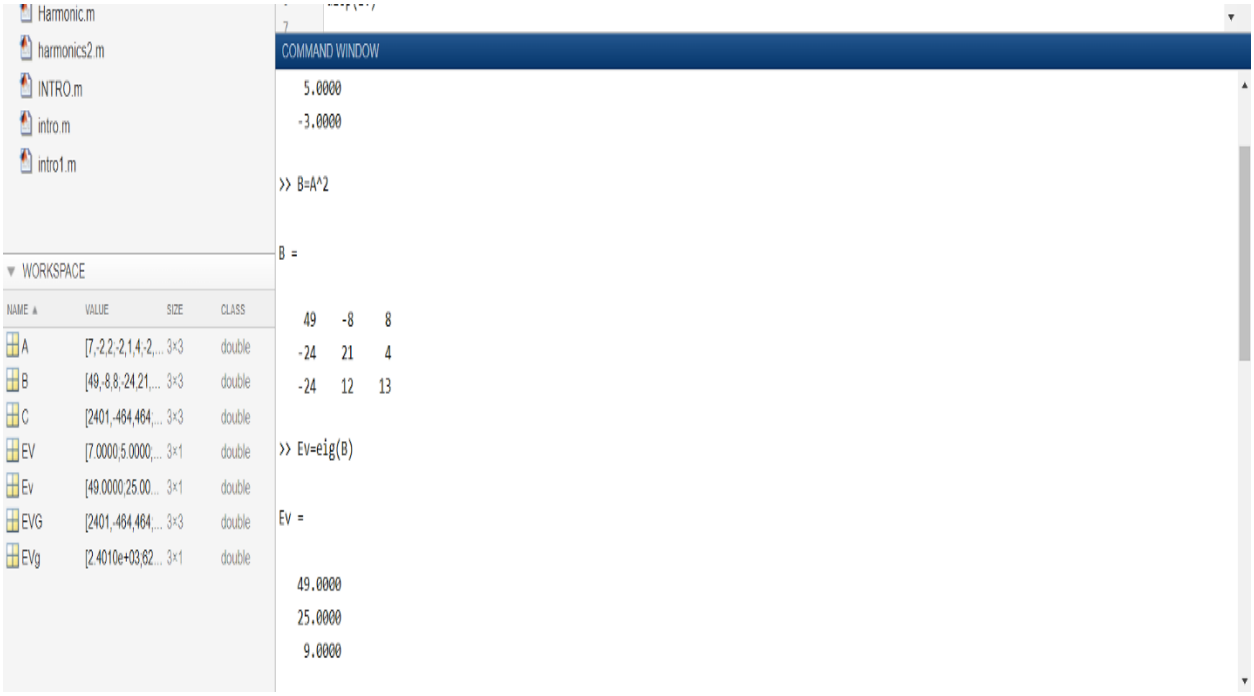
Name
Published (my site)
Eigenv.m
Eigenvalue.m
Harmonic.m
harmonics2.m
INTRO.m
intro.m
intro1.m
Eigenvalue.m
clc
clear all
A=input('Enter the matrix: ');
EV=eig(A);
disp('Eigenvalues')
disp(EV)
COMMAND WINDOW
Enter the matrix:
[7 -2 2;-2 1 4;-2 4 1]
Eigenvalues
7.0000
5.0000
-3.0000
>> B=A^2
B =
49 -8 8
-24 21 4
-24 12 13
>> Ev=eig(B)
Ev =
WORKSPACE
NAME
VALUE
SIZE
CLASS
A [7,-2,2;-2,1,4;-2,... 3×3 double
B [49,-8,8;-24,21,... 3×3 double
C [2401,-464,464;... 3×3 double
EV [7.0000;5.0000;... 3×1 double
Ev [49.0000;25.00... 3×1 double
EVG [2401,-464,464;... 3×3 double
EVg [2.4010e+03;62... 3×1 double

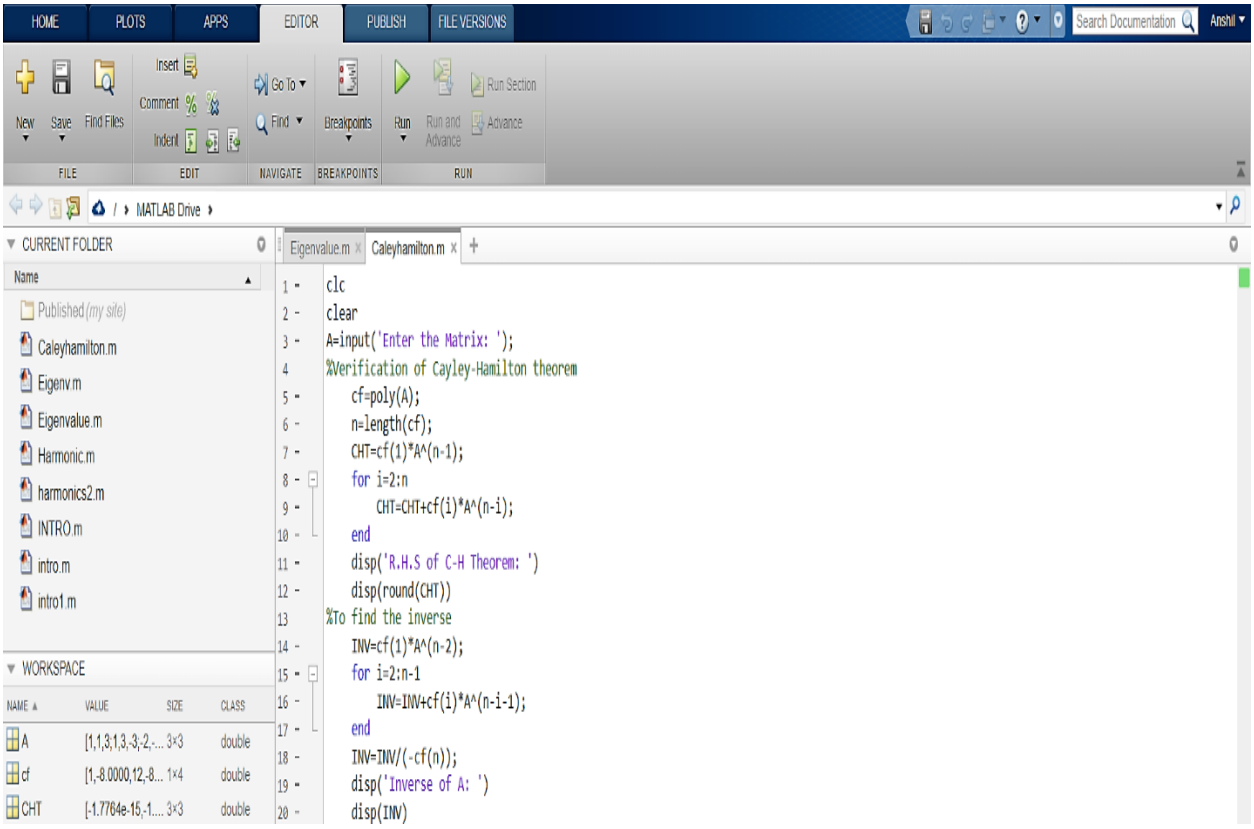

Harmonic.m
harmonics2.m
INTRO.m
intro.m
intro1.m
COMMAND WINDOW
5.0000
-3.0000
>> B=A^2
B =
49 -8 8
-24 21 4
-24 12 13
>> Ev=eig(B)
Ev =
49.0000
25.0000
9.0000
WORKSPACE
NAME
VALUE
SIZE
CLASS
A [7,-2,2;-2,1,4;-2,... 3×3 double
B [49,-8,8;-24,21,... 3×3 double
C [2401,-464,464;... 3×3 double
EV [7.0000;5.0000;... 3×1 double
Ev [49.0000;25.00... 3×1 double
EVG [2401,-464,464;... 3×3 double
EVg [2.4010e+03;62... 3×1 double

Q2. Using Cayley-Hamilton theorem,

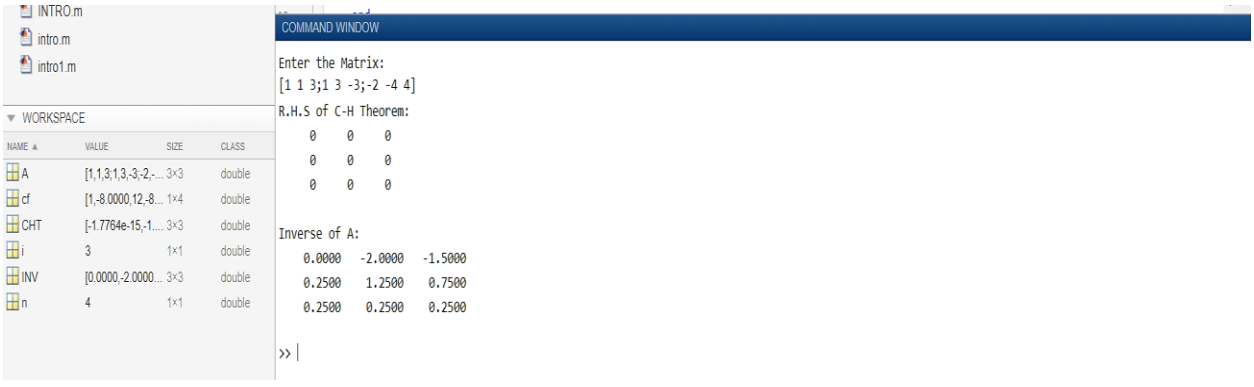
(a) find the inverse of A = [1 1 3; 1 3 −3; −2 −4 −4] .

Sol.: -

CODE: -

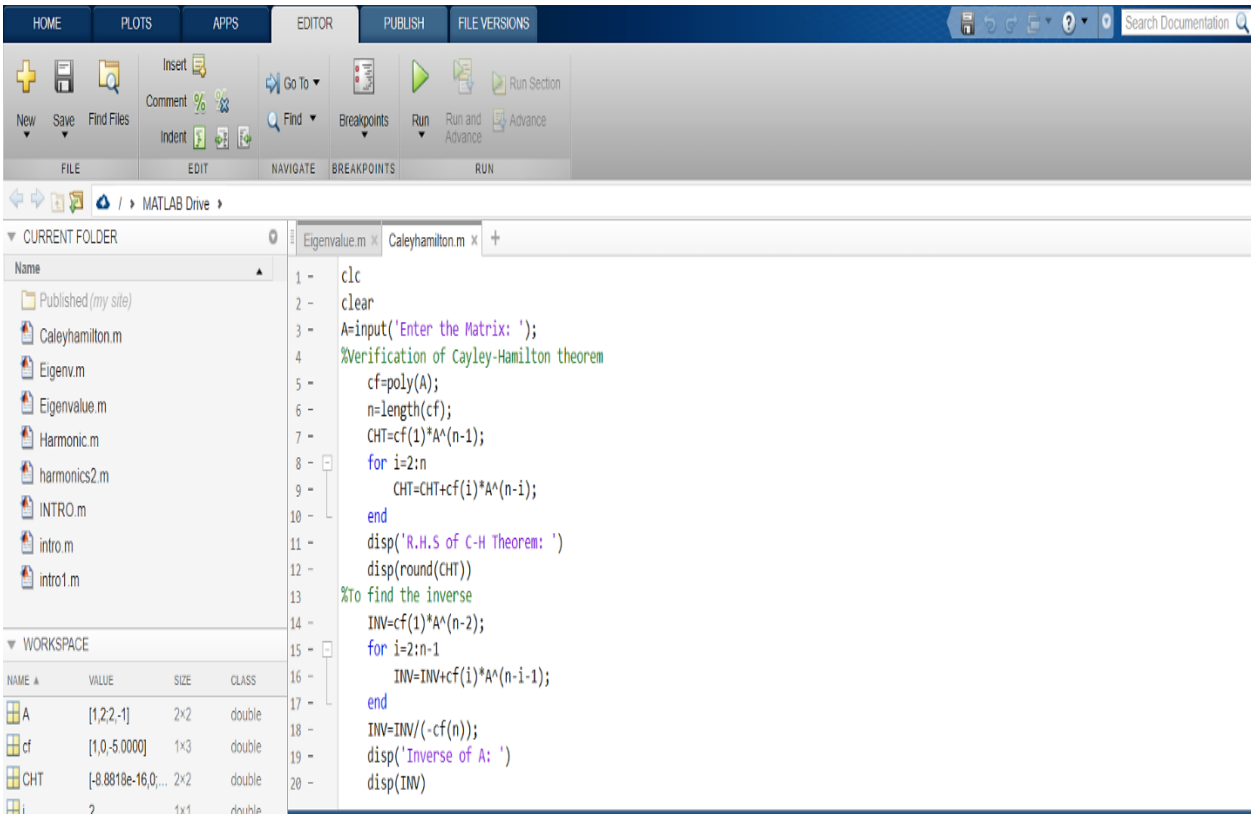


INPUT & OUTPUT: -



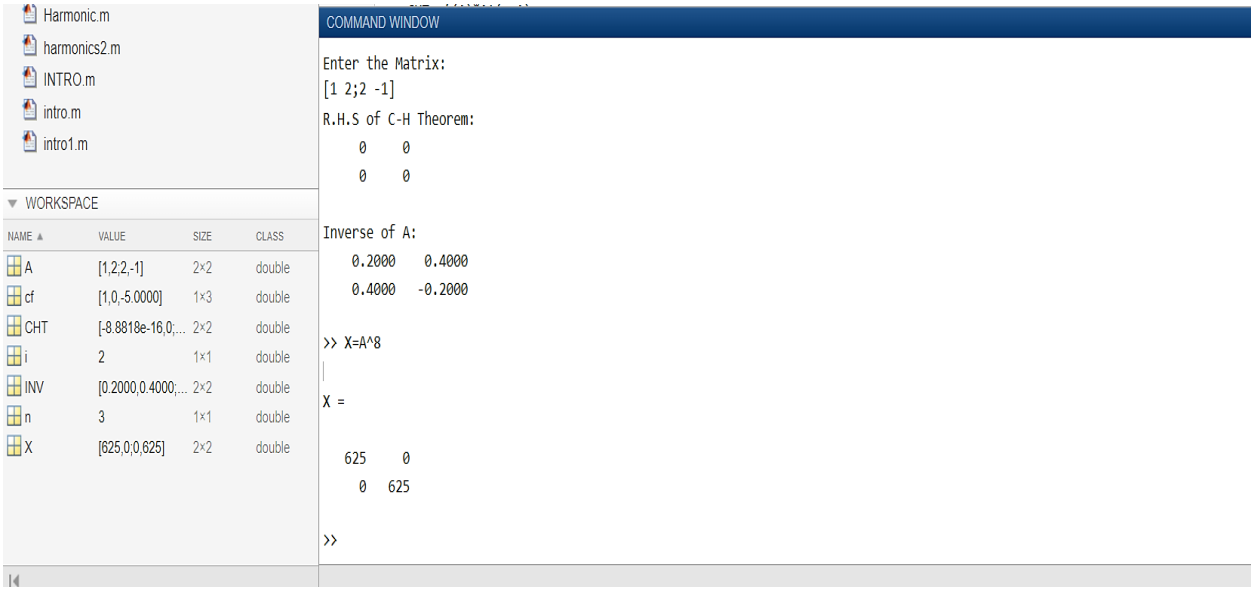
(b) find A8, if A = [1 2 ;2 −1]

CODE:-



```
clc
clear
A=input('Enter the Matrix: ');
%Verification of Cayley-Hamilton theorem
    cf=poly(A);
    n=length(cf);
    CHT=cf(1)*A^(n-1);
    for i=2:n
        CHT=CHT+cf(i)*A^(n-i);
    end
    disp('R.H.S of C-H Theorem: ')
    disp(round(CHT))
%To find the inverse
    INV=cf(1)*A^(n-2);
    for i=2:n-1
        INV=INV+cf(i)*A^(n-i-1);
    end
    INV=INV/(-cf(n));
    disp('Inverse of A: ')
    disp(INV)
```

INPUT AND OUTPUT: -



```
Enter the Matrix:
[1 2;2 -1]
R.H.S of C-H Theorem:
     0     0
     0     0

Inverse of A:
    0.2000    0.4000
    0.4000   -0.2000

>> X=A^8

X =

   625     0
     0   625

>>
```

----------THANK YOU----------