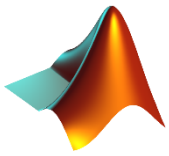
MAT 2002

MATLAB



Lab Assessment – 1

L29+L30

FALL SEMESTER 2020-21

by

SHARADINDU ADHIKARI

19BCE2105

Question 1

Problem:

Input a matrix A, verify Cayley Hamilton Theorem and hence find the inverse of A. (Check whether inverse exists or not.)

Code in MATLAB Editor:

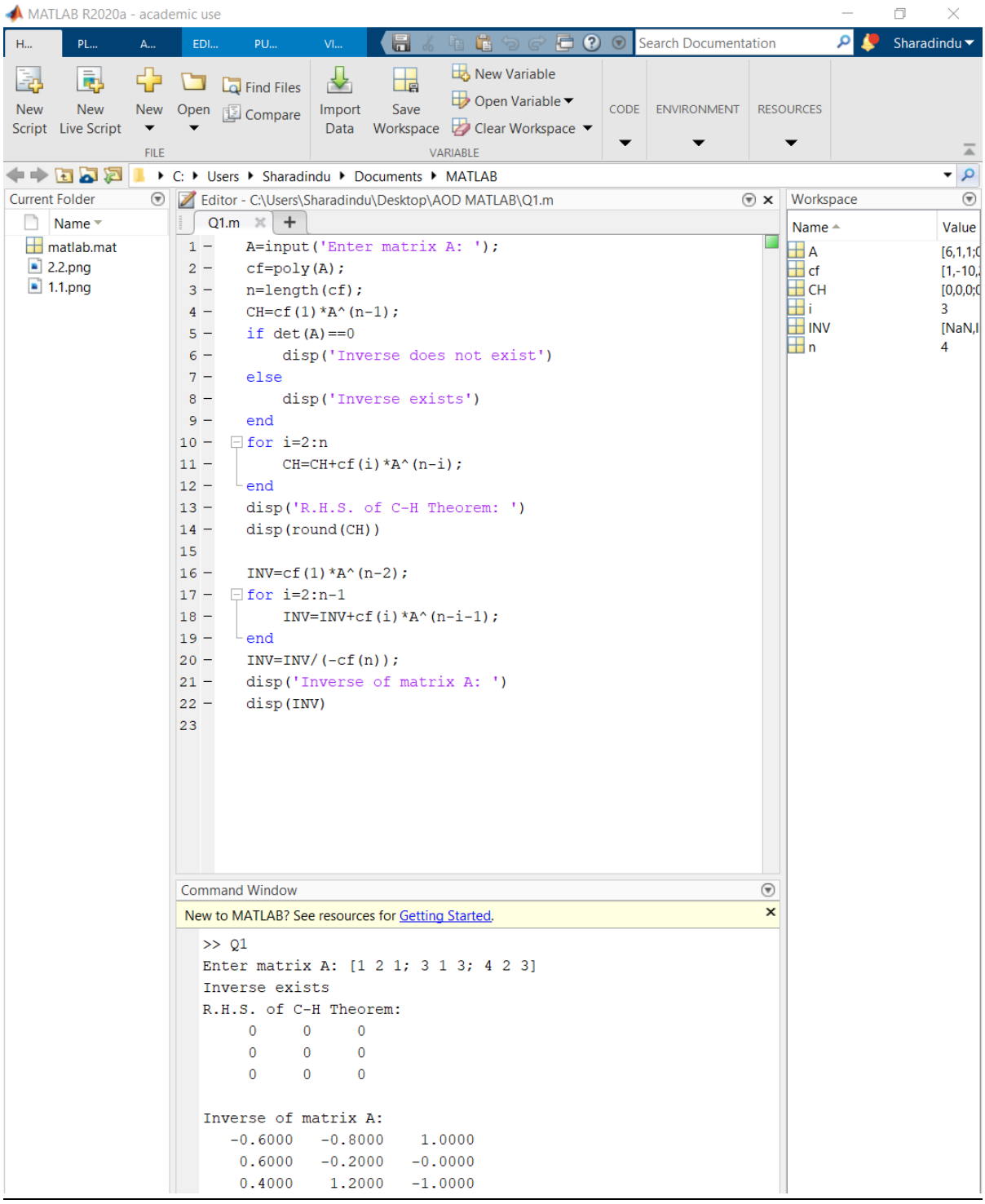
```
A=input('Enter matrix A: ');
cf=poly(A);
n=length(cf);
CH=cf(1)*A^(n-1);
if det(A)==0
    disp('Inverse does not exist')
else
    disp('Inverse exists')
end
for i=2:n
    CH=CH+cf(i)*A^(n-i);
end
disp('R.H.S. of C-H Theorem: ')
disp(round(CH))

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 matrix A: ')
disp(INV)
```

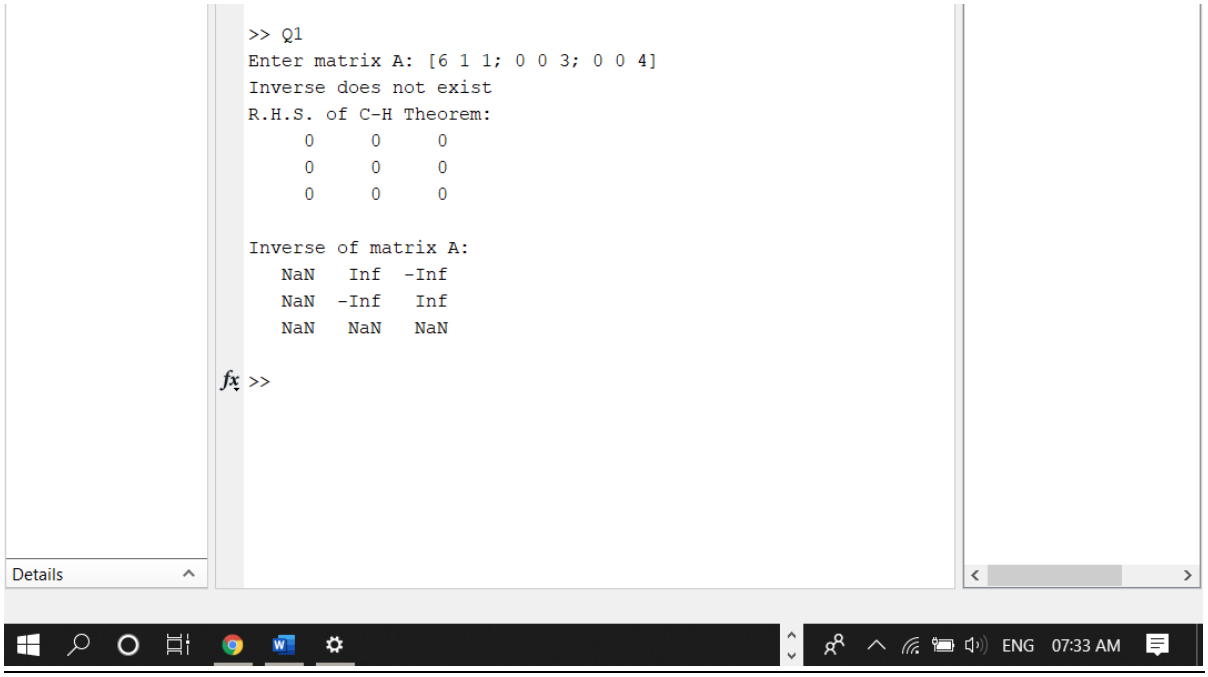
Input & Output in Command Window:

```
>> Q1
Enter matrix A: [1 2 1; 3 1 3; 4 2 3]
Inverse exists
R.H.S. of C-H Theorem:
     0     0     0
     0     0     0
     0     0     0

Inverse of matrix A:
   -0.6000   -0.8000    1.0000
    0.6000   -0.2000   -0.0000
    0.4000    1.2000   -1.0000

>> Q1
Enter matrix A: [6 1 1; 0 0 3; 0 0 4]
Inverse does not exist
```

```
R.H.S. of C-H Theorem:
     0     0     0
     0     0     0
     0     0     0

Inverse of matrix A:
   NaN   Inf  -Inf
   NaN  -Inf   Inf
   NaN   NaN   NaN
```

Screenshot:




>> Q1
Enter matrix A: [6 1 1; 0 0 3; 0 0 4]
Inverse does not exist
R.H.S. of C-H Theorem:
0 0 0
0 0 0
0 0 0
Inverse of matrix A:
NaN Inf -Inf
NaN -Inf Inf
NaN NaN NaN
>>
Details
ENG 07:33 AM

Question 2

Problem:

Diagonalize a matrix A by similarity transformation and hence find A^n (n=9).

Code in MATLAB Editor:

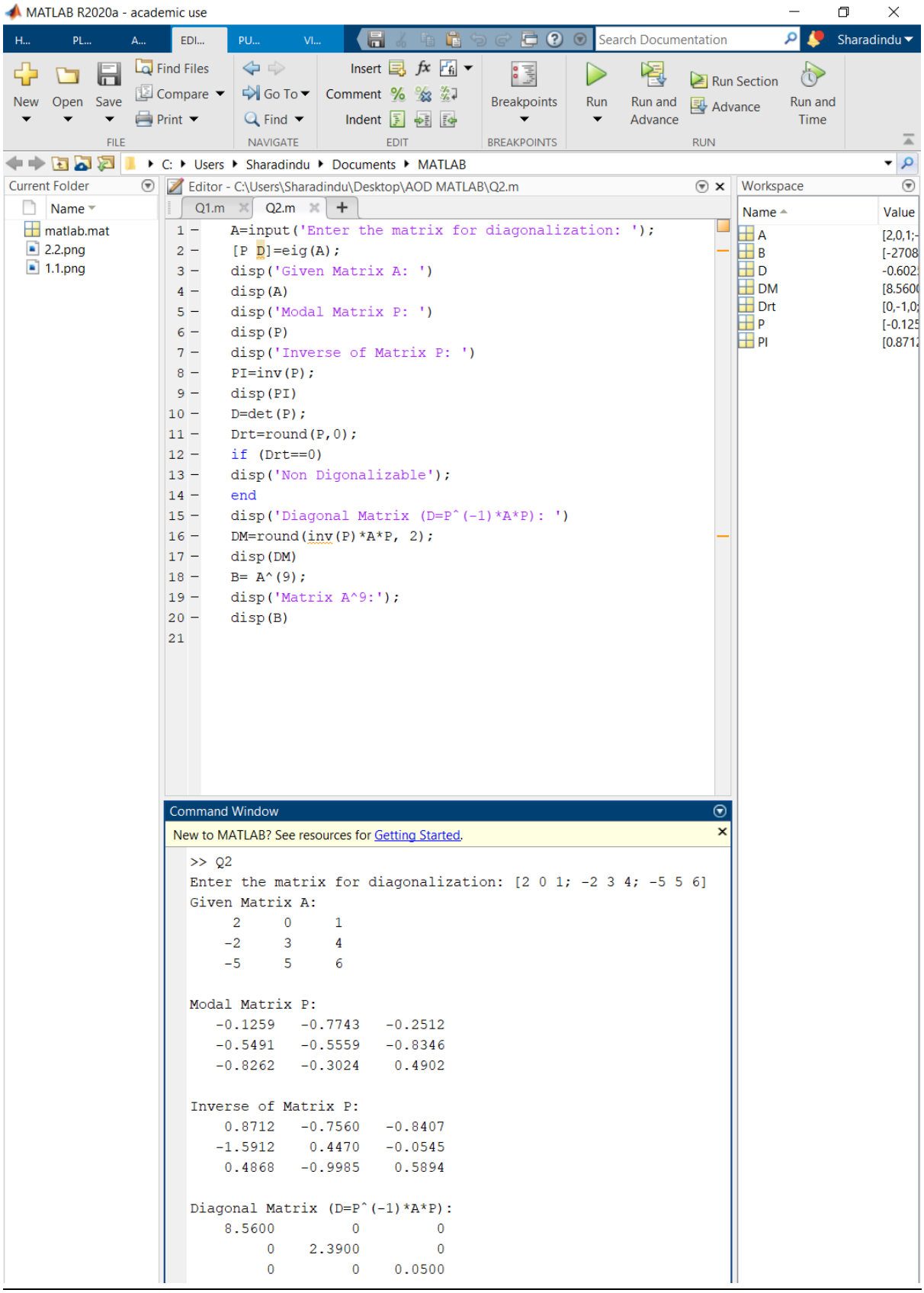
```
A=input('Enter the matrix for diagonalization: ');
[P D]=eig(A);
disp('Given Matrix A: ')
disp(A)
disp('Modal Matrix P: ')
disp(P)
disp('Inverse of Matrix P: ')
PI=inv(P);
disp(PI)
D=det(P);
Drt=round(P,0);
if (Drt==0)
disp('Non Digonalizable');
end
disp('Diagonal Matrix (D=P^(-1)*A*P): ')
DM=round(inv(P)*A*P, 2);
disp(DM)
B= A^(9);
disp('Matrix A^9:');
disp(B)
```

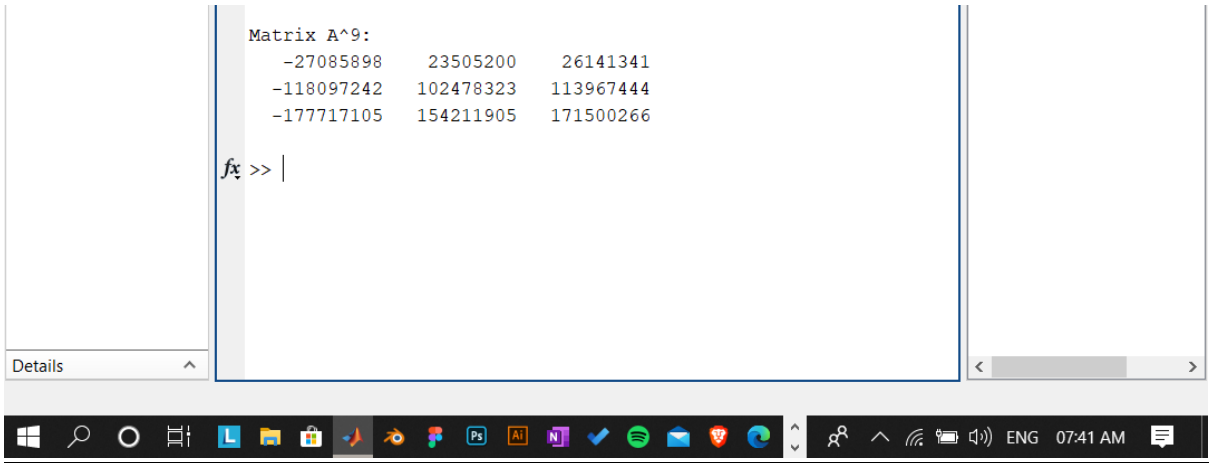
Input & Output in Command Window:

```
>> Q2
Enter the matrix for diagonalization: [2 0 1; -2 3 4; -5 5 6]
Given Matrix A:
     2     0     1
    -2     3     4
    -5     5     6

Modal Matrix P:
   -0.1259   -0.7743   -0.2512
   -0.5491   -0.5559   -0.8346
   -0.8262   -0.3024    0.4902

Inverse of Matrix P:
    0.8712   -0.7560   -0.8407
   -1.5912    0.4470   -0.0545
    0.4868   -0.9985    0.5894

Diagonal Matrix (D=P^(-1)*A*P):
    8.5600         0         0
         0    2.3900         0
         0         0    0.0500
```

```
Matrix A^9:
   -27085898    23505200    26141341
  -118097242   102478323   113967444
  -177717105   154211905   171500266
```

Screenshot:




Matrix A^9:
-27085898 23505200 26141341
-118097242 102478323 113967444
-177717105 154211905 171500266
>>
Details
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07:41 AM

Question 3

Problem:

Diagonalize a symmetric matrix A by finding an orthogonal matrix P and hence find A^n (n=8).

Code in MATLAB Editor:

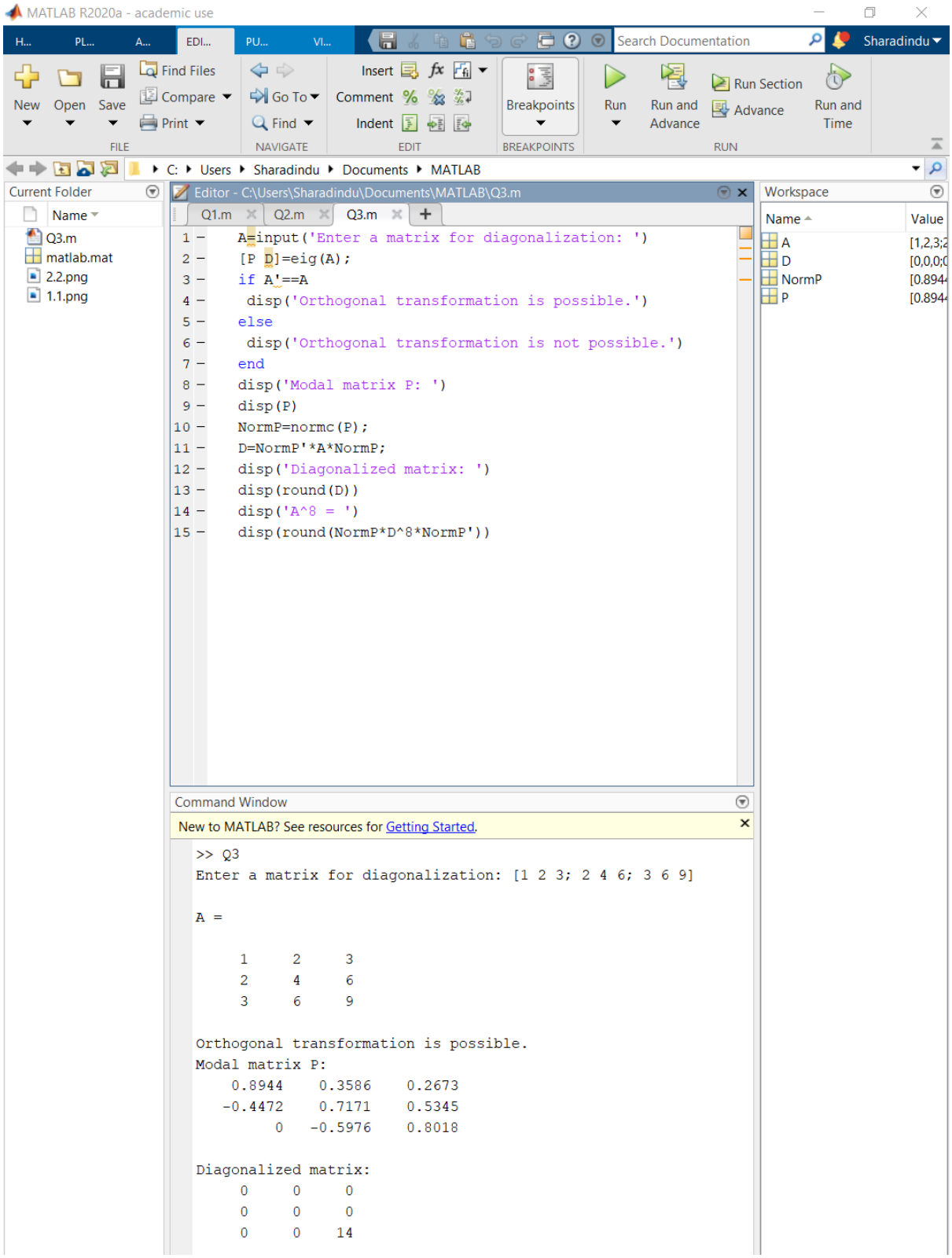
```
A=input('Enter a matrix for diagonalization: ')
[P D]=eig(A);
if A'==A
 disp('Orthogonal transformation is possible.')
else
 disp('Orthogonal transformation is not possible.')
end
disp('Modal matrix P: ')
disp(P)
NormP=normc(P);
D=NormP'*A*NormP;
disp('Diagonalized matrix: ')
disp(round(D))
disp('A^8 = ')
disp(round(NormP*D^8*NormP'))
```

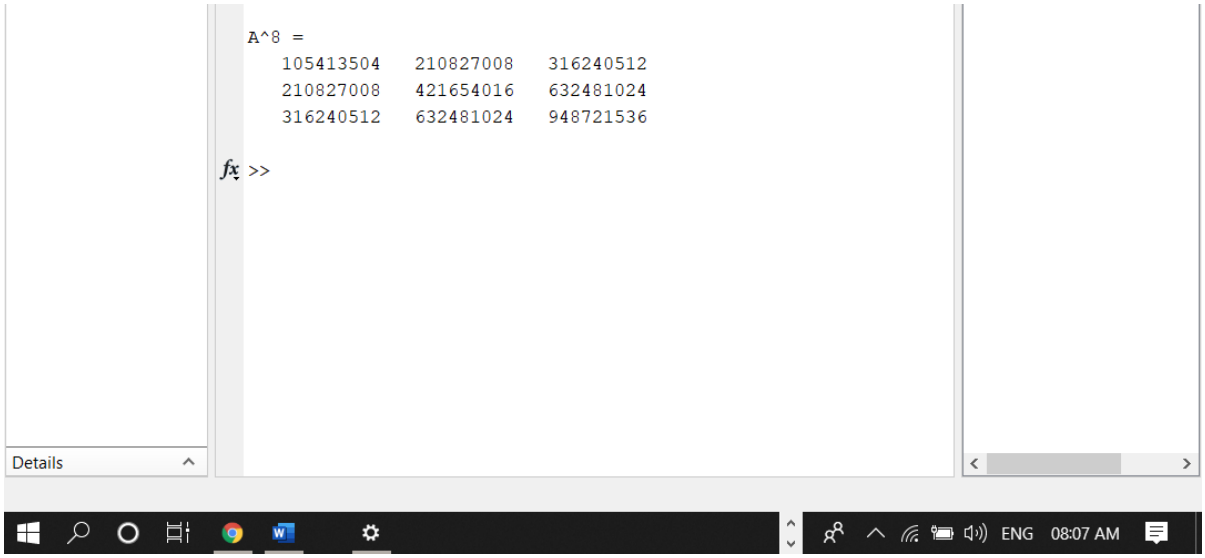
Input & Output in Command Window:

```
>> Q3
Enter a matrix for diagonalization: [1 2 3; 2 4 6; 3 6 9]

A =

     1     2     3
     2     4     6
     3     6     9

Orthogonal transformation is possible.
Modal matrix P:
    0.8944    0.3586    0.2673
   -0.4472    0.7171    0.5345
         0   -0.5976    0.8018

Diagonalized matrix:
     0     0     0
     0     0     0
     0     0    14
```

```
A^8 =
   105413504   210827008   316240512
   210827008   421654016   632481024
   316240512   632481024   948721536
```

Screenshot:




A^8 =
105413504 210827008 316240512
210827008 421654016 632481024
316240512 632481024 948721536
>>
Details
ENG
08:07 AM

End