SUMESH R - 20104169

In [1]:
```
import numpy as np
import pandas as pd
import numpy.linalg as la
```

1. Create 5 matrices with five different dimensions (1-D,2-D,...5-D)

In [2]:
```
a1=np.array([1,2,3])
a1
```

Out[2]:
```
array([1, 2, 3])
```

In [3]:
```
a2=np.array([[1,3],[2,4]])
a2
```

Out[3]:
```
array([[1, 3],
       [2, 4]])
```

In [4]:
```
a3=np.array([[1,2,3],[2,3,4],[3,4,5]])
a3
```

Out[4]:
```
array([[1, 2, 3],
       [2, 3, 4],
       [3, 4, 5]])
```

In [5]:
```
a4=np.array([[1,2,4,3],[2,3,4,5],[2,3,4,5],[4,5,4,6]])
a4
```

Out[5]:
```
array([[1, 2, 4, 3],
       [2, 3, 4, 5],
       [2, 3, 4, 5],
       [4, 5, 4, 6]])
```

In [6]:
```
a5=np.array([[1,2,4,3,5],[1,2,3,4,5],[2,3,6,4,5],[4,5,3,4,6],[7,6,5,3,2]])
a5
```

Out[6]:
```
array([[1, 2, 4, 3, 5],
       [1, 2, 3, 4, 5],
       [2, 3, 6, 4, 5],
       [4, 5, 3, 4, 6],
       [7, 6, 5, 3, 2]])
```

2. Find determinants of 5 matrices and display your output

In [8]:
```
la.det(a2)
```

Out[8]:
```
-2.0
```

In [9]:
```
la.det(a3)
```

Out[9]:
```
-7.401486830834414e-17
```

In [10]:
```
la.det(a4)
```

Out[10]:
```
0.0
```

In [11]:
```
la.det(a5)
```

Out[11]:
```
54.00000000000006
```

In [12]:
```
a6=np.array([[1,2,4,3,2],[1,2,3,4,5],[2,3,6,4,5],[4,5,3,4,6],[7,6,5,3,2]])
la.det(a6)
```

Out[12]:
```
-135.00000000000014
```

3. Find inverse of the above 5 matrices and display your output

In [15]:
```
la.inv(a2)
```

Out[15]:
```
array([[-2. ,  1.5],
       [ 1. , -0.5]])
```

In [16]:
```
la.inv(a3)
```

Out[16]:
```
array([[ 1.35107989e+16, -2.70215978e+16,  1.35107989e+16],
       [-2.70215978e+16,  5.40431955e+16, -2.70215978e+16],
       [ 1.35107989e+16, -2.70215978e+16,  1.35107989e+16]])
```

In [18]:
```
la.inv(a5)
```

Out[18]:
```
array([[ 1.96296296e+00,  7.77777778e-01, -1.92592593e+00,
         -9.62962963e-01,  8.51851852e-01],
       [-2.35185185e+00, -1.11111111e+00,  2.20370370e+00,
          1.35185185e+00, -9.07407407e-01],
       [ 1.29629630e-01, -2.22222222e-01,  2.40740741e-01,
         -1.29629630e-01,  1.85185185e-02],
       [-8.70370370e-01,  7.77777778e-01,  2.40740741e-01,
         -1.29629630e-01,  1.85185185e-02],
       [ 1.16666667e+00, -5.28570827e-16, -8.33333333e-01,
         -1.66666667e-01,  1.66666667e-01]])
```

In [19]:
```
la.inv(a6)
```

Out[19]:
```
array([[-7.85185185e-01,  7.77777778e-01,  3.70370370e-02,
        -5.70370370e-01,  4.59259259e-01],
       [ 9.40740741e-01, -1.11111111e+00, -1.48148148e-01,
         8.81481481e-01, -4.37037037e-01],
       [-5.18518519e-02, -2.22222222e-01,  3.70370370e-01,
        -1.03703704e-01, -7.40740741e-03],
       [ 3.48148148e-01,  7.77777778e-01, -6.29629630e-01,
        -3.03703704e-01,  1.92592593e-01],
       [-4.66666667e-01,  2.11428331e-16,  3.33333333e-01,
         6.66666667e-02, -6.66666667e-02]])
```

In [21]:
```
a7=np.array([[7,5],[26,7]])
la.inv(a7)
```

Out[21]:
```
array([[-0.08641975,  0.0617284 ],
       [ 0.32098765, -0.08641975]])
```

4. Find the rank, diagonal and trace of the 5 matrices

In [38]:
```
print(la.matrix_rank(a2))
print(np.diag(a2))
print(np.trace(a2))
```

```
2
[1 4]
5
```

In [40]:
```
print(la.matrix_rank(a3))
print(np.diag(a3))
print(np.trace(a3))
```

```
2
[1 3 5]
9
```

In [42]:
```
print(la.matrix_rank(a4))
print(np.diag(a4))
print(np.trace(a4))
```

```
3
[1 3 4 6]
14
```

In [43]:
```
print(la.matrix_rank(a5))
print(np.diag(a5))
print(np.trace(a5))
```

```
5
[1 2 6 4 2]
15
```

In [45]:
```
print(la.matrix_rank(a7))
print(np.diag(a7))
print(np.trace(a7))
```

```
2
[7 7]
14
```

5. Find Eigen value and eigen vector for 5 matrices

In [31]:
```
x,y=la.eig(a2)
print("x: ",x)
print("y: ", y)
la.eigvals(a2)
```

```
x:  [-0.37228132  5.37228132]
y:  [[-0.90937671 -0.56576746]
 [ 0.41597356 -0.82456484]]
```

Out[31]:
```
array([-0.37228132,  5.37228132])
```

In [32]:
```
x,y=la.eig(a3)
print("x: ",x)
print("y: ", y)
la.eigvals(a3)
```

```
x:  [ 9.62347538e+00 -6.23475383e-01  6.75139028e-17]
y:  [[-0.38508979 -0.82767094  0.40824829]
 [-0.55951021 -0.14241368 -0.81649658]
 [-0.73393063  0.54284358  0.40824829]]
```

Out[32]:
```
array([ 9.62347538e+00, -6.23475383e-01,  6.75139028e-17])
```

In [33]:
```
x,y=la.eig(a4)
print("x: ",x)
print("y: ", y)
la.eigvals(a4)
```

```
x:  [ 1.50000000e+01+0.j        -5.00000000e-01+0.8660254j
 -5.00000000e-01-0.8660254j  7.11205115e-16+0.j       ]
y:  [[ 3.45218868e-01+0.j         -3.06186218e-01+0.53033009j
  -3.06186218e-01-0.53033009j  6.96310624e-01+0.j        ]
 [ 4.85863592e-01+0.j         -3.06186218e-01-0.1767767j
  -3.06186218e-01+0.1767767j  -6.96310624e-01+0.j        ]
 [ 4.85863592e-01+0.j         -3.06186218e-01-0.1767767j
  -3.06186218e-01+0.1767767j   1.74077656e-01+0.j        ]
 [ 6.39294200e-01+0.j          6.12372436e-01+0.j
   6.12372436e-01-0.j          5.41683339e-16+0.j        ]]
```

Out[33]:
```
array([ 1.50000000e+01+0.j       , -5.00000000e-01+0.8660254j,
       -5.00000000e-01-0.8660254j,  7.11205115e-16+0.j       ])
```

In [34]:
```
x,y=la.eig(a5)
print("x: ",x)
print("y: ", y)
la.eigvals(a5)
```

```
x:  [19.28434715 -5.35254592  1.26417664  0.5527265  -0.74870437]
y:  [[ 0.36419692  0.37562272 -0.35048786  0.52722118  0.36519126]
 [ 0.36561283  0.38372161  0.48847562 -0.6102211  -0.60100148]
 [ 0.47778486  0.15498786 -0.4352443   0.17173614 -0.05712966]
 [ 0.50508984  0.11163818  0.62535373 -0.45695836  0.66626307]
 [ 0.50029366 -0.82169396 -0.24092518  0.33371214 -0.24137583]]
```

Out[34]:
```
array([19.28434715, -5.35254592,  1.26417664,  0.5527265 , -0.74870437])
```

In [35]:
```
x,y=la.eig(a6)
print("x: ",x)
print("y: ", y)
la.eigvals(a6)
```

```
x:  [18.7277593 +0.j         -2.44975606+1.55221246j -2.44975606-1.55221246j
  1.68146915+0.j         -0.50971632+0.j        ]
y:  [[-0.29903844+0.j         -0.18205706-0.26910549j -0.18205706+0.26910549j
  -0.1384531 +0.j          0.56626176+0.j        ]
 [-0.38062012+0.j          0.45552235+0.03554183j  0.45552235-0.03554183j
   0.35885214+0.j         -0.78220159+0.j        ]
 [-0.49643566+0.j          0.17103037-0.0221954j   0.17103037+0.0221954j
  -0.62478466+0.j         -0.05207289+0.j        ]
 [-0.51633436+0.j          0.29704394+0.22115167j  0.29704394-0.22115167j
   0.66263014+0.j          0.2118398 +0.j        ]
 [-0.50264779+0.j         -0.72026832+0.j         -0.72026832-0.j
  -0.15040379+0.j          0.14114036+0.j        ]]
```

Out[35]:
```
array([18.7277593 +0.j        , -2.44975606+1.55221246j,
       -2.44975606-1.55221246j,  1.68146915+0.j        ,
       -0.50971632+0.j        ])
```