In [1]:
```
import pandas as py
import numpy as np
from numpy import linalg as la
```

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

In [32]:
```
a = np.array([[1,2,3,4,5],[6,7,8,9,5],[11,23,14,15,16],[12,34,17,18,19],[19,21,22,23,
b = np.array([[1,2,3,4],[6,7,7,8],[0,9,8,8],[6,5,4,4]])
c = np.array([[1,2,3],[6,7,7],[0,9,8]])
d =  np.array([[1,2],[6,7]])
e = np.array([1])
a
```

Out[32]:
```
array([[ 1,  2,  3,  4,  5],
       [ 6,  7,  8,  9,  5],
       [11, 23, 14, 15, 16],
       [12, 34, 17, 18, 19],
       [19, 21, 22, 23, 35]])
```

In [15]:
```
b
```

Out[15]:
```
array([[1, 2, 3, 4],
       [6, 7, 7, 8],
       [0, 9, 8, 8],
       [6, 5, 4, 4]])
```

In [16]:
```
c
```

Out[16]:
```
array([[1, 2, 3],
       [6, 7, 7],
       [0, 9, 8]])
```

In [17]:
```
d
```

Out[17]:
```
array([[1, 2],
       [6, 7]])
```

In [18]:
```
e
```

Out[18]:
```
array([1])
```

2. Find determinants of 5 matrices and display your output

In [34]:
```
print(la.det(a))
```

```
-2090.0000000000005
```

In [20]:
```
print(la.det(b))
```

```
-3.999999999999999
```

In [21]:
```
print(la.det(c))
```

```
59.000000000000014
```

In [22]:
```
print(la.det(d))
```

```
-4.999999999999999
```

In [26]:
```
f = np.array([[1,2,3],[4,5,6],[9,8,7]])
print(la.det(f))
```

```
9.868649107779138e-17
```

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

In [33]:
```
print(la.inv(a))
```

```
[[-0.13014354 -0.30526316  1.29186603 -0.71770335 -0.13875598]
 [ 0.00909091 -0.1         0.18181818 -0.04545455 -0.04545455]
 [-0.98277512  1.23157895 -4.02392344  2.12440191  0.6507177 ]
 [ 0.90382775 -0.62631579  2.55023923 -1.36124402 -0.46650718]
 [ 0.08899522 -0.13684211  0.0430622  -0.02392344  0.02870813]]
```

In [35]:
```
print(la.inv(b))
```

```
[[ 1.00000000e+00 -1.00000000e+00  1.48029737e-16  1.00000000e+00]
 [-1.20000000e+01  1.20000000e+01 -1.00000000e+00 -1.00000000e+01]
 [ 3.00000000e+01 -3.10000000e+01  3.00000000e+00  2.60000000e+01]
 [-1.65000000e+01  1.75000000e+01 -1.75000000e+00 -1.47500000e+01]]
```

In [36]:
```
print(la.inv(c))
```

```
[[-0.11864407  0.18644068 -0.11864407]
 [-0.81355932  0.13559322  0.18644068]
 [ 0.91525424 -0.15254237 -0.08474576]]
```

In [37]:
```
print(la.inv(d))
```

```
[[-1.4  0.4]
 [ 1.2 -0.2]]
```

In [47]:
```
print(la.inv(f))
```

```
[[-1.31730289e+17  1.01330992e+17 -3.03992975e+16]
 [ 2.63460578e+17 -2.02661983e+17  6.07985950e+16]
```

[1.31730289e+17 1.01330992e+17 3.03992975e+16]]

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

In [39]:
```
print(la.matrix_rank(a))
```

```
5
```

In [40]:
```
print(np.diag(a))
```

```
[ 1  7 14 18 35]
```

In [41]:
```
print(np.trace(a))
```

```
75
```

In [48]:
```
print(np.trace(f))
```

```
13
```

Find Eigen value and eigen vector for 5 matrices

In [42]:
```
print(la.eig(a))
```

```
(array([72.65498524, 11.09734565, -6.56591117, -1.98781438, -0.19860534]), array([[
0.10153391,  0.09959857, -0.2448098 , -0.86154825, -0.29013881],
       [ 0.18573934, -0.28692268, -0.48548262, -0.11396582, -0.03414362],
       [ 0.41929403, -0.21628447,  0.28780837,  0.39145207,  0.81481596],
       [ 0.51702155, -0.45426339,  0.75853133,  0.28685097, -0.50070194],
       [ 0.71559276,  0.80908671, -0.2148752 ,  0.09606355, -0.00511819]]))
```

In [45]:
```
x,y = la.eig(a)
print(x)
```

```
[72.65498524 11.09734565 -6.56591117 -1.98781438 -0.19860534]
```

In [46]:
```
print(y)
```

```
[[ 0.10153391  0.09959857 -0.2448098  -0.86154825 -0.29013881]
 [ 0.18573934 -0.28692268 -0.48548262 -0.11396582 -0.03414362]
 [ 0.41929403 -0.21628447  0.28780837  0.39145207  0.81481596]
 [ 0.51702155 -0.45426339  0.75853133  0.28685097 -0.50070194]
 [ 0.71559276  0.80908671 -0.2148752   0.09606355 -0.00511819]]
```

In [44]:
```
print(la.eigvals(a))
```

```
[72.65498524 11.09734565 -6.56591117 -1.98781438 -0.19860534]
```

In [49]:
```
x,y = la.eig(b)
print(x)
```

```
[21.65236501+0.j         -1.82915955+0.j          0.08839727+0.30525672j
  0.08839727-0.30525672j]
```

In [50]:
```
print(y)
```

```
[[-0.22961933+0.j         -0.31382379+0.j          0.01372213-0.04718479j
   0.01372213+0.04718479j]
 [-0.61662802+0.j          0.16204921+0.j         -0.31683983+0.03159295j
  -0.31683983-0.03159295j]
 [-0.63949069+0.j         -0.67533389+0.j          0.8267463 +0.j
   0.8267463 -0.j        ]
 [-0.39761351+0.j          0.64744021+0.j         -0.46116622-0.00399584j
  -0.46116622+0.00399584j]]
```

In [59]:
```
print(la.eigvals(b))
```

```
[21.65236501+0.j         -1.82915955+0.j          0.08839727+0.30525672j
  0.08839727-0.30525672j]
```

In [51]:
```
x,y = la.eig(c)
print(x)
```

```
[-0.2303748 +1.87915177j -0.2303748 -1.87915177j 16.46074961+0.j        ]
```

In [52]:
```
print(y)
```

```
[[ 0.08795253+0.36387142j  0.08795253-0.36387142j  0.22412998+0.j        ]
 [ 0.61848106-0.14121104j  0.61848106+0.14121104j  0.66751679+0.j        ]
 [-0.67631544+0.j         -0.67631544-0.j          0.71006133+0.j        ]]
```

In [60]:
```
print(la.eigvals(c))
```

```
[-0.2303748 +1.87915177j -0.2303748 -1.87915177j 16.46074961+0.j        ]
```

In [54]:
```
x,y = la.eig(d)
print(x)
```

```
[-0.58257569  8.58257569]
```

In [56]:
```
print(y)
```

```
[[-0.78419037 -0.25504011]
 [ 0.62052031 -0.96693047]]
```

In [61]:
```
print(la.eigvals(d))
```

```
[-0.58257569  8.58257569]
```

In [57]:
```
x,y = la.eig(f)
print(x)
```

```
[ 1.53459030e+01 -2.34590301e+00  2.92332046e-16]
```

In [58]:
```
print(y)
```

```
[[ 0.24369531  0.47808341  0.40824829]
 [ 0.55533903  0.38462197 -0.81649658]
 [ 0.79511708 -0.78962155  0.40824829]]
```

In [62]:
```
print(la.eigvals(f))
```

```
[ 1.53459030e+01 -2.34590301e+00  2.92332046e-16]
```