practical no.:-05

practical name :- Matrix

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class:- sybsc(cs)

div:-B

sign:-

In [1]:
```
# Q.construct the following standard matrix in python:
```

In [3]:
```

   from sympy import*
```

In [ ]:
```
Q.1
```

In [4]:
```
eye(3)
```

Out[4]:
$$\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

In [5]:
```
eye(5)
```

Out[5]:
$$\begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{bmatrix}$$

In [6]:
```
zeros(2)
```

Out[6]:
$$\begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$$

In [7]:
```
zeros(5,4)
```

Out[7]:
$$\begin{bmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{bmatrix}$$

In [10]:
```
ones(4)
```

Out[10]:
$$\begin{bmatrix} 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 \end{bmatrix}$$

In [11]:
```
diag(-1,0,pi)
```

Out[11]:
$$\begin{bmatrix} -1 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & \pi \end{bmatrix}$$

In [5]:
```
diag(1/2,-2,pi/2)
```

Out[5]:
$$\begin{bmatrix} 0.5 & 0 & 0 \\ 0 & -2 & 0 \\ 0 & 0 & \frac{\pi}{2} \end{bmatrix}$$

In [ ]:
```
Q.2
```

In [17]:
```
A=Matrix([[1,3,3],[1,4,4],[1,3,4]])
B=Matrix([[1,2,3],[2,5,3],[1,0,8]])
C=Matrix([[1,1,3],[-2,2,1],[0,1,1]])
```

In [18]:
```
A+B+C
```

Out[18]:
$$\begin{bmatrix} 3 & 6 & 9 \\ 1 & 11 & 8 \\ 2 & 4 & 13 \end{bmatrix}$$

In [19]:
```
A-B+2*C
```

Out[19]:
$$\begin{bmatrix} 2 & 3 & 6 \\ -5 & 3 & 3 \\ 0 & 5 & -2 \end{bmatrix}$$

In [20]:
```
3*A-2*B
```

Out[20]:
$$\begin{bmatrix} 1 & 5 & 3 \\ -1 & 2 & 6 \\ 1 & 9 & -4 \end{bmatrix}$$

In [21]:
```
A*B-C*A
```

Out[21]:
$$\begin{bmatrix} 5 & 1 & 17 \\ 12 & 17 & 41 \\ 9 & 10 & 36 \end{bmatrix}$$

In [22]:
```
B.T
```

Out[22]:
$$\begin{bmatrix} 1 & 2 & 1 \\ 2 & 5 & 0 \\ 3 & 3 & 8 \end{bmatrix}$$

In [24]:
```
(A+C).T
```

Out[24]:
$$\begin{bmatrix} 2 & -1 & 1 \\ 4 & 6 & 4 \\ 6 & 5 & 5 \end{bmatrix}$$

In [25]:
```
(6*B-2*A).T
```

Out[25]:
$$\begin{bmatrix} 4 & 10 & 4 \\ 6 & 22 & -6 \\ 12 & 10 & 40 \end{bmatrix}$$

In [26]:
```
A*A
```

Out[26]:
$$\begin{bmatrix} 7 & 24 & 27 \\ 9 & 31 & 35 \\ 8 & 27 & 31 \end{bmatrix}$$

In [27]:
```
A**3+3*A**2+2*A
```
Out[27]:
$$\begin{bmatrix} 81 & 276 & 312 \\ 104 & 357 & 404 \\ 92 & 312 & 357 \end{bmatrix}$$

In [28]:
```
B**2-2*A+eye(3)
```
Out[28]:
$$\begin{bmatrix} 7 & 6 & 27 \\ 13 & 22 & 37 \\ 7 & -4 & 60 \end{bmatrix}$$

In [30]:
```
B.inv()
```
Out[30]:
$$\begin{bmatrix} -40 & 16 & 9 \\ 13 & -5 & -3 \\ 5 & -2 & -1 \end{bmatrix}$$

In [32]:
```
A.adjoint()
```
Out[32]:
$$\begin{bmatrix} 1 & 1 & 1 \\ 3 & 4 & 3 \\ 3 & 4 & 4 \end{bmatrix}$$

In [33]:
```
B.adjoint()
```
Out[33]:
$$\begin{bmatrix} 1 & 2 & 1 \\ 2 & 5 & 0 \\ 3 & 3 & 8 \end{bmatrix}$$

In [34]:
```
(A*B).T
```
Out[34]:
$$\begin{bmatrix} 10 & 13 & 11 \\ 17 & 22 & 17 \\ 36 & 47 & 44 \end{bmatrix}$$

In [35]:
```
A.T*B.T
```
Out[35]:
$$\begin{bmatrix} 6 & 10 & 9 \\ 20 & 35 & 27 \\ 23 & 38 & 35 \end{bmatrix}$$

In [36]:
```
(A+B).inv()
```

Out[36]:
$$\begin{bmatrix} \frac{87}{10} & -\frac{21}{5} & -\frac{19}{10} \\ -\frac{11}{5} & \frac{6}{5} & \frac{2}{5} \\ -\frac{9}{10} & \frac{2}{5} & \frac{3}{10} \end{bmatrix}$$

In [38]:
```
B.inv()+A.inv()
```

Out[38]:
$$\begin{bmatrix} -36 & 13 & 9 \\ 13 & -4 & -4 \\ 4 & -2 & 0 \end{bmatrix}$$

In [39]:
```
B.inv()*A.inv()
```

Out[39]:
$$\begin{bmatrix} -169 & 136 & -7 \\ 55 & -44 & 2 \\ 21 & -17 & 1 \end{bmatrix}$$

In [6]:
```
from math import*
```

In [ ]:
```
Q.3
```

In [9]:
```
E=Matrix([[0,3,6,4,9],[1,2,1,3,1],[2,3,0,3,1],[1,4,5,9,7]])
```

In [10]:
```
E.row(2)
```

Out[10]:
$$\begin{bmatrix} 2 & 3 & 0 & 3 & 1 \end{bmatrix}$$

In [11]:
```
E.row(3)
```

Out[11]:
$$\begin{bmatrix} 1 & 4 & 5 & 9 & 7 \end{bmatrix}$$

In [12]:
```
E.row_del(1)
```

In [13]:
```
E.col_del(3)
```

In [ ]:
```
Q.4
```

In [46]:
```
G=Matrix([[1,2,2,2],[2,3,1,5],[4,1,4,1],[5,3,2,1]])
```

In [47]:
```
G.rref()
```

Out[47]:
```
(Matrix([
 [1, 0, 0, 0],
 [0, 1, 0, 0],
 [0, 0, 1, 0],
 [0, 0, 0, 1]]),
 (0, 1, 2, 3))
```

In [48]:
```
H=Matrix([[0,3,6,4,9],[1,2,1,3,1],[2,3,0,3,1],[1,4,5,9,7]])
```

In [50]:
```
H.rref()
```

Out[50]:
```
(Matrix([
 [1, 0, -3, 0, 0],
 [0, 1,  2, 0, 0],
 [0, 0,  0, 1, 0],
 [0, 0,  0, 0, 1]]),
 (0, 1, 3, 4))
```

In [52]:
```
I=Matrix([[1,1,3],[3,5,8],[2,-1,3]])
```

In [53]:
```
I.rref()
```

Out[53]:
```
(Matrix([
 [1, 0, 0],
 [0, 1, 0],
 [0, 0, 1]]),
 (0, 1, 2))
```

In [81]:
```
from sympy import*
```

In [82]:
```
x,y,z=symbols("x,y,z")
```

In [83]:
```
J=Matrix([[1,1,1,],[2,5,7],[2,1,-1]])
```

In [84]:
```
k=Matrix([[9,52,0]])
```

In [85]:
```
linsolve((J,k),[x,y,z])
```

Out[85]: $\{(1,\ 3,\ 5)\}$

In [89]:
```
x,y,z,w=symbols("x,y,z,w")
```

In [90]:
```
L=Matrix([[1,2,-3,2],[1,5,-8,6],[3,4,-5,2]])
```

In [91]:
```
M=Matrix([[2,5,4]])
```

In [92]:
```
linsolve((L,M),[x,y,z,w])
```

Out[92]: $\{(0,\ 2w+1,\ 2w,\ w)\}$

In [93]:
```
x1,x2,x3,x4=symbols("x1,x2,x3,x4")
```

In [94]:
```
N=Matrix([[1,-1,2,-1],[2,1,-2,-2],[-1,2,-4,1]])
```

In [95]:
```
O=Matrix([[-1,-2,1]])
```

In [96]:
```
linsolve((N,O),[x1,x2,x3,x4])
```

Out[96]: $\{(x_4-1,\ 2x_3,\ x_3,\ x_4)\}$

In [105]:
```
Q=Matrix([[1,2,3,4,5],[6,7,8,9,0],[12,32,21,32,54],[45,65,43,65,76]])
```

In [106]:
```
Q.rank()
```

Out[106]: 4

In [107]:
```
R=Matrix([[5,2,3,4,5],[6,7,8,9,0],[12,32,21,32,54],[45,65,43,65,76]])
```

In [108]:
```
R.rank()
```

Out[108]: 4

In [110]:
```
s=Matrix([[1,2,3],[-2,-3,-2],[2,3,-2]])
```

In [111]:
```
s.nullspace()
```

Out[111]: []

In [ ]:

In [ ]: