

# 1. Creating Matrices

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## 0.1 1. Creating Matrices

### 1.1 Creating matrices using numpy library

```
[1]: import numpy as np
A = np.array([[2,1,0],[1,-1,2]]) #Create Matrix A of size 2x3
print(A)
```

```
[[ 2  1  0]
 [ 1 -1  2]]
```

```
[2]: B = np.array([[1,1,3],[2,1,0]])
print(B)
```

```
[[1 1 3]
 [2 1 0]]
```

### 1.2 Creating Matrices using sympy library

```
[3]: import sympy as sp
      #sp.init_printing()

M = sp.Matrix([[-1,7,-1],[0,1,0],[0,15,-2]])
M
```

```
[3]: 
$$\begin{bmatrix} -1 & 7 & -1 \\ 0 & 1 & 0 \\ 0 & 15 & -2 \end{bmatrix}$$

```

```
[4]: #Create matrix by providing dimension
N = sp.Matrix(3,3,[0,0,-2,1,2,1,1,0,3])
N
```

```
[4]: 
$$\begin{bmatrix} 0 & 0 & -2 \\ 1 & 2 & 1 \\ 1 & 0 & 3 \end{bmatrix}$$

```

```
[5]: P = sp.Matrix(5,3,[1,2,3,1,2,3,3,2,1,3,4,5,3,2,1])
display(P)
```

$$\begin{bmatrix} 1 & 2 & 3 \\ 1 & 2 & 3 \\ 3 & 2 & 1 \\ 3 & 4 & 5 \\ 3 & 2 & 1 \end{bmatrix}$$

### 1.3 Assessing rows and columns of a matrix

```
[6]: P.row(-4)
```

```
[6]: [1  2  3]
```

```
[7]: P.col(1)
```

```
[7]: [2]
      [2]
      [2]
      [4]
      [2]
```

```
[8]: #Accessing 3 row 3rd element
      P.row(2)[2]
```

```
[8]: 1
```

```
[9]: P.col(1)[3]
```

```
[9]: 4
```

### 1.4 Deleting and inserting rows and columns

```
[26]: A = sp.Matrix(4,5,[1,5,3,9,0,-2,1,3,-7,3,2,7,1,0,-1,3,6,5,4,2])
      A
```

```
[26]: [ 1  5  3  9  0]
      [-2  1  3 -7  3]
      [ 2  7  1  0 -1]
      [ 3  6  5  4  2]
```

```
[27]: A.row_del(1)
      A
```

```
[27]: [1  5  3  9  0]
      [2  7  1  0 -1]
      [3  6  5  4  2]
```

```
[28]: A.col_del(3)
      A
```

```
[28]: [1  5  3  0]
      [2  7  1 -1]
      [3  6  5  2]
```

```
[29]: B = sp.Matrix(5,4,[1,9,8,3,2,0,9,0,1,0,2,7,3,5,0,1,2,5,3,6])
B
```

```
[29]: 
$$\begin{bmatrix} 1 & 9 & 8 & 3 \\ 2 & 0 & 9 & 0 \\ 1 & 0 & 2 & 7 \\ 3 & 5 & 0 & 1 \\ 2 & 5 & 3 & 6 \end{bmatrix}$$

```

```
[30]: C = B.row_insert(0,sp.Matrix([[ -1,0,1,0]]))
C
```

```
[30]: 
$$\begin{bmatrix} -1 & 0 & 1 & 0 \\ 1 & 9 & 8 & 3 \\ 2 & 0 & 9 & 0 \\ 1 & 0 & 2 & 7 \\ 3 & 5 & 0 & 1 \\ 2 & 5 & 3 & 6 \end{bmatrix}$$

```

```
[31]: D = B.col_insert(4,sp.Matrix([ -1,1,0,1,-1]))
D
```

```
[31]: 
$$\begin{bmatrix} 1 & 9 & 8 & 3 & -1 \\ 2 & 0 & 9 & 0 & 1 \\ 1 & 0 & 2 & 7 & 0 \\ 3 & 5 & 0 & 1 & 1 \\ 2 & 5 & 3 & 6 & -1 \end{bmatrix}$$

```

### 1.5 Getting dimension/size of the matrix

```
[32]: sp.shape(B)
```

```
[32]: (5, 4)
```

### 1.7 Matrix constructors for common matrices

```
[34]: #Create identity matrix of size 3
```

```
M1 = sp.eye(3)
M1
```

```
[34]: 
$$\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

```

```
[35]: M2 = sp.zeros(2,3)
M2
```

```
[35]: 
$$\begin{bmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}$$

```

```
[36]: M3 = sp.ones(4,5)
M3
```

```
[36]: 
$$\begin{bmatrix} 1 & 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 & 1 \end{bmatrix}$$

```

```
[37]: M4 = sp.diag(1,2,3,4)
M4
```

```
[37]: 
$$\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 2 & 0 & 0 \\ 0 & 0 & 3 & 0 \\ 0 & 0 & 0 & 4 \end{bmatrix}$$

```

```
[ ]:
```