

220801179

**EX.NO:** 01

**NUMPY**

**DATE:** 16/02/2024

**AIM:**

To calculate the values for the mathematical formulas using NumPy library

**INTEGRATED DEVELOPMENT ENVIRONMENT (IDE) REQUIRED:**

JUPYTER NOTEBOOK

**REQUIRED LIBRARIES FOR PYTHON:**

Numpy

**PROCEDURE:**

**1. Euclidean distance**

The mathematical formula for calculating the Euclidean distance between 2 points in 2D space:

$$d(p, q) = \sqrt{(q_1 - p_1)^2 + (q_2 - p_2)^2}$$

**PROGRAM:**

```
#CALCULATE EUCLIDEAN DISTANCE

import math

a = [9]
b = [1]
print (math.dist(a,b))

a = [3, 7]
b = [6, 12]
print (math.dist(a, b))
```

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## OUTPUT:

```
8.0  
5.8309518948453
```

## 2. Dot Product

$$u = \begin{bmatrix} 5 \\ 12 \end{bmatrix}, \quad v = \begin{bmatrix} 8 \\ 6 \end{bmatrix}$$

$$\begin{aligned} \text{Dot product is } u \cdot v &= u_1 \times v_1 + u_2 \times v_2 \\ &= 5 \times 8 + 12 \times 6 \\ &= 112 \end{aligned}$$

## PROGRAM:

```
# DOTPRODUCT OF TWO VECTORS  
  
import numpy as np  
  
a1 = 3  
b1 = 5  
A = np.dot(a1,b1)  
print(A)  
  
p = [[2, 1], [0, 3]]  
q = [[1, 1], [3, 2]]  
print(np.dot(p, q))  
  
a2 = 4 + 5j  
b2 = 8 + 6j  
print(np.dot(a2, b2))  
  
a3 = [[5, 3], [0, 3]]  
b3 = [[1, 7], [3, 6]]  
print(np.dot(b, a))
```

## OUTPUT:

```
15  
[[5 4]  
 [9 6]]  
(2+64j)  
102
```

### 3. Solving a System of Linear Equations

A system of linear equations can be represented in matrix form as  $AX=B$ , where  $A$  is the matrix of coefficients,  $X$  is the column vector of variables, and  $B$  is the column vector of solutions. To solve for  $X$ , we can use:  $X=A^{-1}B$  assuming  $A$  is invertible.

#### PROGRAM:

```
#SOLVING LINEAR EQUATIONS

import numpy as np

a = np.array([[1,1,1],[0,2,5],[2,5,-1]])
b = np.array([[6],[-4],[27]])
x = np.dot(np.linalg.inv(a),b)
print(x)
```

#### OUTPUT:

```
[[ 5.]
 [ 3.]
 [-2.]]
```