Ex.No-1 NUMPY

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:**

## A) Euclidean distance

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

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

## B) Dot Product

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

Dot product is 
$$u\cdot v = u_1 imes v_1 + u_2 imes v_2$$
 
$$= 5 imes 8 + 12 imes 6$$
 
$$= 112$$

## C) 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  $\mathbf{X}$ , we can use:  $X = A^{-1}$  B assuming A is invertible.

#### PROGRAM:

## A) Calculating the Euclidean Distance Between Two Points

importnumpy as np

defeuclidean\_distance(p, q):

```
returnnp.sqrt(np.sum((q - p) ** 2))
# Example usage
p = np.array([1, 2])
q = np.array([4, 6])
distance = euclidean_distance(p, q)
print("Output for Calculating the Euclidean Distance Between Two Points is: ",distance)
```

## B) Calculating the Dot Product of Two Vectors

```
importnumpy as np
```

A = np.array([1, 3, -5])

B = np.array([4, -2, -1])

 $dot_product = np.dot(A, B)$ 

print("Output for dot product of two vectors A and B is ",dot product)

## C) Solving a System of Linear Equations

importnumpy as np

# Coefficients matrix A and result vector b

A = np.array([[3, 1], [1, 2]])

b = np.array([9, 8])

# Solve for x

x = np.linalg.solve(A, b)

print("Output solution of System of Linear Equations is ",x)

# **Output:**

A)Output for Calculating the Euclidean Distance between Two Points is: 5.0. Exercise 2 –B)Output for dot product of two vectors A and B is 3

C)Output solution of System of Linear Equations is [2. 3.]

#### **Result:**

The programs were run successfully