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 $u \cdot v = u_1 \times v_1 + u_2 \times v_2$

$= 5 \times 8 + 12 \times 6$

$= 112$

C) Solving a System of Linear Equations

A system of linear equations can be represented in matrix form as AX=B, whereA 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:

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