EX.No:4	Solving linear equations for engineering and business use cases using matrix algebra in Python.
DATE:	

AIM:

To write a program to solve linear equations for engineering and business use cases using matrix algebra in Python.

ALGORITHM:

- **Step 1:** Import the necessary library, such as NumPy: import numpy as np.
- **Step 2:** Input or define two arrays, say array1=A and array2=B.
- **Step 3:** Use the numpy.np function, passing both arrays as arguments:
  - A = np.array([[2, 3, 4,5], [1, -1, 5,1], [2, 3, 5,7], [1,2,3,4]])
  - B = np.array([8, 2, 10,12])
  - X = np.linalg.solve(A, B)
- **Step 4:** The solution is X.
- **Step 5:** End.

PROGRAM:1

- **Solving 2x2 Linear System using NumPy**

```
import numpy as np
A = np.array([[2, 3], [1, -1]])
B = np.array([8, 2])
X = np.linalg.solve(A, B)
print("Solution:", X)
```

- **Solving 3x3 Linear System using NumPy**

```
import numpy as np
A = np.array([[2, 3, 4], [1, -1, 5], [2, 3, 5]])
B = np.array([8, 2, 10])
X = np.linalg.solve(A, B)
print("Solution:", X)
```

- **Solving 4x4 Linear System using NumPy**

```
import numpy as np
A = np.array([[2, 3, 4,5], [1, -1, 5,1], [2, 3, 5,7], [1,2,3,4]])
B = np.array([8, 2, 10,12])
X = np.linalg.solve(A, B)
print("Solution:", X)
```

OUTPUT:

```
In [4]: %runfile E:/DMK/PYTHON/untitled1.py --wdir
Solution: [2.8 0.8]
Solution: [-4.8  3.2  2. ]
Solution: [-18.    9.8   6.4  -2.2]
```

PROGRAM: 2

The upward speed v(*t*) of a rocket at time t is approximated by $v(t) = at^2 + bt + c$, $0 \leq t \leq 100$ where a, b, and c are constants. It has been found that the speed at times t = 3, t = 6 , and t = 9 seconds are respectively, 64, 133, and 208 miles per second respectively. Develop the python program to find the speed at time t = 15 seconds.

```
import numpy as np
# Create the system of equations using the given data points
# Each row: [t^2, t, 1] for t = 3, 6, 9

A = np.array ([[3**2, 3, 1],[6**2, 6, 1],[9**2, 9, 1]])

# Corresponding speeds at t = 3, 6, 9

B = np.array([64, 133, 208])

# Solve for a, b, c

coefficients = np.linalg.solve(A, B)
a, b, c = coefficients
```

```
# Calculate speed at t = 15

t = 15
v_15 = a*t**2 + b*t + c

# Output
print(f"Coefficients: a = {a:.2f}, b = {b:.2f}, c = {c:.2f}")
print(f"Speed at t = 15 seconds: {v_15:.2f} miles/sec")
```

```
In [7]: %runfile E:/DMK/PYTHON/untitled10.py --wdir
Coefficients: a = 0.33, b = 20.00, c = 1.00
Speed at t = 15 seconds: 376.00 miles/sec
```

Result:

Thus, python program is successfully implemented to compute the matrix operations of a given array.

Exercise:

1. Solve the following system of linear equations $5x + 2y = 3$, $3x + 2y = 5$ using python

2. Construct a python program to solve the following system of equations $2x_1 + 3x_2 + 3x_3 = 5$, $x_1 – 2x_2 + x_3 = -4$, $3x_1 – x_2 – 2x_3 = 3$.

3. The velocity of a sports car (in) at time seconds is given by the equation: During a test run, the car's velocity was recorded as: Construct a python program to find the velocity of the car at seconds.

4. In a T20 match, Chennai Super Kings needed just 6 runs to win with 1 ball left to go in the last over. The last ball was bowled and the batsman at the crease hit it high up. The ball traversed along a path in a vertical plane and the equation of the path is $y = ax^2 + bx + c$ with respect to a xy - coordinate system in the vertical plane and the ball traversed through the points (10,8), (20,16), (30,18) , can you conclude that Chennai Super Kings won the match?