MA-221(Numerical Analysis)
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Lab Assignment-11
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Instructions

- Solve each problem using Python, C++, and MATLAB.

1. House Price

Background: We assume a linear relationship between house size and price. That means as house size increases, the price increases at a constant rate. Using least squares regression, we can calculate the best-fit line in the form: Price=a.Size+b

House Size(sq. ft.)	House Price(1000s)
1500	245
1600	265
1700	275
1800	295
2000	325

Task:

Find a straight line approximation using the least square method for the above given data.

2. Population

Background:

In biology, populations often grow non-linearly. Here, population increases faster over time, so a power model fits better than a straight line. The power function: Population=a.(Time)^b

Time(years)	**Population**
1	120
2	300
3	550
4	900
5	1400

Task:

Find the power fit $y = a.x^2$ and $y = b.x^3$ for the data given above and determine which curve fits best.

3. Animation Path-Smooth Motion of an Object

Background:

In animation, you often know an object's position at specific times (keyframes). But for smooth motion, you need the positions between those times. A cubic spline will fit a smooth cubic polynomial between each pair of points.

Time (s)	**Position** (X)
0	0
1	1.5
2	1.8
3	2.5
4	3.2

Tasks:

1. Interpolate the object's position at 1.5s using cubic spline.
2. Interpolate the object's position at 2.7s using cubic spline.

4. Engine Calibration-Torque vs RPM

Background:

Engine calibration involves creating maps that describe how torque varies with RPM. But measurements are usually taken at just a few RPM values. A cubic spline models the torque curve smoothly across all RPMs.

RPM	**Torque** (Nm)
1000	130
1500	142
2000	160
2500	155
3000	148

Tasks:

1. Interpolate the torque estimates at 1800 using cubic spline.
2. Interpolate the torque estimates at 2400 using cubic spline.