

MA-221(Numerical Analysis)  
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Lab assignment-9  
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1. For the data

$x$	-2	-1	0	1	2	3
$f(x)$	15	5	1	3	11	25

construct the forward difference formula. Hence, find  $f(0.5)$ .

2. For the following data, calculate the differences and obtain the Newton's forward and backward difference interpolation polynomials. Are these polynomials different? Interpolate at  $x = 0.25$  and  $x = 0.35$ .

$x$	0.1	0.2	0.3	0.4	0.5
$f(x)$	1.40	1.56	1.76	2.00	2.28

3. Weather Forecasting (Temperature Prediction)

In meteorology, scientists often collect temperature data over a period of time for specific locations. Using Newton's interpolation methods, they can estimate temperatures at times where direct data measurements aren't available.

You have hourly temperature data from 8:00 AM to 12:00 PM as follows:

Time (Hours)	Temperature( $^{\circ}\text{C}$ )
8:00 AM	22
9:00 AM	23
10:00 AM	24
11:00 AM	26
12:00 AM	28

Predict the temperature at 10:30 AM using the Newton's forward difference interpolation.

4. GPS and Navigation (Location Estimation)

In GPS technology, your location is estimated by triangulating distances from several satellites. These distances can be recorded at discrete time intervals, and Newton's interpolation methods can help estimate your position at a particular time.

Suppose your GPS device reports the following distance readings from three satellites at different times:

Time (s)	Satellite 1 Distance (m)	Satellite 2 Distance (m)	Satellite 3 Distance (m)
0	1000	1200	900
5	1010	1210	910
10	1020	1220	920

To estimate your location at  $t = 7$  seconds (between 5 and 10 seconds), use the Newton's forward difference interpolation.