**NEWTON INTERPOLATION**

1. Given the data

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **x** | 1.6 | 2 | 2.5 | 3.2 | 4 | 4.5 |
| **f(x)** | 2 | 8 | 14 | 15 | 8 | 2 |

1. Calculate f(2.8) using Newton’s interpolating polynomial. Print polynomial coefficients on the screen. Using different markers plot given and obtained data.

2. Given the data

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **x** | 1 | 2 | 3 | 5 | 7 | 8 |
| **f(x)** | 3 | 6 | 19 | 99 | 291 | 444 |

Calculate *f* (4) using Newton’s interpolating polynomials of order 1 through 4. Choose your base points to attain good accuracy. What do your results indicate regarding the order of the polynomial used to generate the data in the table?

3. The following data come from a table that was measured with high precision. Use the best numerical method (for this type of problem) to determine *y* at *x=* 3.5. Note that a polynomial will yield an exact value. Plot the graph to prove that your result is exact.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **x** | 0 | 1.8 | 5 | 6 | 8.2 | 9.2 | 12 |
| **y** | 26 | 16.415 | 5.375 | 3.5 | 2.015 | 2.54 | 8 |

4. Use Newton’s interpolating polynomial to determine *y* at *x=*3.5 to the best possible accuracy. Compute the finite divided differences

and order your points to attain optimal accuracy and convergence.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **x** | 0 | 1 | 2.5 | 3 | 4.5 | 5 | 6 |
| **y** | 2 | 5.4375 | 7.3516 | 7.5625 | 8.4453 | 9.1875 | 12 |

5. Use Newton’s interpolating polynomial to determine *y* at *x=*8 to the best possible accuracy. Compute the finite divided differences

and order your points to attain optimal accuracy and convergence.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **x** | 0 | 1 | 2 | 5.5 | 11 | 13 | 16 | 18 |
| **y** | 0.5 | 3.134 | 5.3 | 9.9 | 10.2 | 9.35 | 7.2 | 6.2 |