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CS 3010.01  
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Project 3: Report

Please view the source code link: <https://colab.research.google.com/drive/1W4izIJbjjEY05pQO29momhW_j-gCOCeo>

1. Store the given points: (0,1), (1.9), (2,23), (4,93), (6,259):
   1. Source code:  
      A screenshot of a cell phone

      Description automatically generated
   2. n is the number of inputs given, y[][] is used for the divided difference table where y[][0] is used as input, and xx is the x coordinates in space, while yy is f(x)

I had to construct a program to:

1. Construct a divided difference table
   1. Source code:   
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   2. Function dividedDiffTable is used to calculating the divided difference table, and function printDiffTable is used to display the divided difference table. I first calculate the divided difference table, stored in the variable y, and print it by calling the void function printDiffTable.
   3. The output contains a divided difference table:  
      A picture containing object

      Description automatically generated
2. Find the coefficients of Newton interpolation polynomial and plot the same as graph highlighting the given points also
   1. Source code:  
      A picture containing screenshot

      Description automatically generated
   2. Function getNDDCoeffs creates a Newton Divided Difference pyramid and extracts the coefficients. The variable pyramid creates a square matrix to hold the pyramid and the first column is y. In the nested for loop, we create the pyramid by updating other columns. Once we’ve completed our pyramid, we return the first row, before simplifying, as it is our target polynomial. Because we want to find the resulting polynomial, we take in our target polynomial. n is the number of coefficients, and we create a dummy polynomial to store it into p. We know that each vector has a degree of i, and the terms are dependent on ‘x’ values, so we multiply the dummy. Then we apply our coefficient and add to the target polynomial. We receive the resulting polynomial once this nested for loop finishes and can now display both data. For plotting, we evaluate the polynomial at X axis and plot the data.
   3. The output contained a polynomial in nested form and the graph:  
      A screenshot of a cell phone

      Description automatically generated
3. Find the value of the function at X = 4.2
   1. Source code:   
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      Description automatically generated
   2. Function preterm is used to find the product term, and function applyFormula is used to applying Newton’s divided difference formula. The variable value is used to store the value to be interpolated, which is 4.2 in this case. We then print out the value received from calling it into the function.
   3. The output contained the value of the function at X = 4.2  
      