Lab 07
MATH 3180: Numerical Analysis

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Contents

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CSCI/MATH 3180
Lab Assignments #6 and #7

Construct the Newton form of the interpolating polynomial of degree 8 for the function $f(x) = \dfrac{1}{(x^2 + 1)}$

using the data points at x = -8,-6, -4, -2, 0, 2, 4, 6, 8.

Lab #6. Use Maple to do the following task.
1. Create the nine data points.
2. Create the divided difference table using the data set.
3. Create the Newton form of the interpolating polynomial of degree 8, $P_8(x)$ using the data set.
4. Evaluate f(x), $P_8(x)$, and | f(x)-$P_8(x)$| for the 17 points at x = -8,-7,-6, -5, -4, -3,-2, -1, 0, 1, 2, 3, 4, 5, 6,7,8.
5. Plot f(x) and $P_8(x)$

Submission: YourLastNameMaple6.mw

Lab #7. Use Visual Studio 2015 to do the following task.
1. Create a C++ console application project in Visual Studio 2015 and name your project **YourLastName7**.
2. Write a program that implements the Newton Interpolation discussed in class.
3. Write a separate function for each of the following. You may define and call additional functions.
   - Computation of divided differences
   - Evaluation of the interpolating polynomial
     Must use a nested form as discussed in class.
4. Your program must store divided differences in a single dimensional array.
5. All floating point arithmetic will be **double** precision.
6. Program input:
      Sequence of x values of data points
      Sequence of x values to evaluate P(x)
7. Program output
   - Divided differences at each iteration
   - Table containing f(x), P(x), |f(x) – P(x)| for the 17 data points.

Submission
1. Delete the following from your Visual Studio project folder.
   ➢ *Debug* sub-folder
   ➢ *Debug* sub-sub-folder under your project folder(second level down)
   ➢ *sdf* file.
2. Save the following in a compressed (zipped) folder.
      YourLastName7 -- *main project folder*
3. Submit the compressed folder to D2L.
4. **Confirm** your submission.
   ➢ **Download** the zipped folder which you have submitted and **check the contents**.
   ➢ Multiple submissions are allowed, but the last submission will be graded.

NOTE: LABS MUST BE YOUR ORIGINAL AND INDEPENDENT WORK.

LABs #6 and #7 EVALUATION RUBRIC

Lab 6: Maple worksheet	
✓ Maple worksheet meets the requirements described above.	__/10

Lab 7: Programming Project		
	Solve the assigned problem using methods described in program description.	
1	The program input meets the requirements. (1 pt) ➢ Sequence of x values of data points ➢ Sequence of x values to evaluate P(x) The program implements the following separate functions. (1 pt) ➢ Computation of divided differences ➢ Evaluation of the interpolating polynomial using a nested form The program stores divided differences in a single dimensional array. (1 pt) Program output meets the requirements. (2 pts) • Divided differences at each iteration • Table containing f(x), P(x), |f(x) – P(x)| for the 17 data points.	__/5
2	Compilation/Execution ➢ Compile without errors when tested in the CSCI computer lab. ➢ Execute without crashing when tested in the CSCI computer lab.	__/1
3	Produce correct answers. ➢ Divided differences at each iteration ➢ Table containing f(x), P(x), |f(x) – P(x)| for the 17 data points	__/2
4	The program output well formatted and properly labeled and identified.	__/1
5	Main Comment Block includes the following. file name due date author course # program description input output	__/0.5
6	Documentation, indentation, and white space usage ✓ Meaning variable names are used and they are briefly described. ✓ Each section of statements in the program is well documented. ✓ Proper INDENTATION is used to make the program easier to read. ✓ WHITE SPACES are used in appropriate places for readability.	__/0.5

7	Contents of zipped folder
	✓ Zip folder contains the two items described above.
	✓ The project folder does NOT contain the following.
	        ❖ Debug sub-folder
	        ❖ Debug sub-sub-folder
	        ❖ .sdf file	

	TOTAL	__/10

0.1 Description of Experiment

0.2 Program Input

0.3 Program Output

0.4 Conclusion/Findings