Math/CS 165 Midterm—Takehome portion

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The following questions are now take-home. The numbered questions are part of the midterm, while the unnumbered question is an extra credit question. They are due Monday, 22 Mar, by the beginning of class. In answering the questions:

(a) You may use a calculator or computer

(b) You must show all work

(c) You may not work with any other human being on it, nor may you share or receive code or answers directly from any human being. An exception is that you may use any of the Sage worksheets I have published on `sage.cs.drake.edu`

(d) All intermediate results in the relevant tables should be included in your answer.

(e) If you used computer code or spreadsheet, you must submit the code or spreadsheet via Blackboard's DropBox by the beginning of class on the due date.

(f) All answers and intermediate calculations should be correct to at least 5 digits after the decimal.

Please note that I've made the questions a bit less computationally expensive by deleting a data point in each question.

Please sign and date the following if it is true.

All work shown on this exam is my own work, in my own words.

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Please list all sources of help that you used in working on this exam. Include references, computational aids, etc.

14. Given the following set of data points:

x	y
8.1	16.94410
8.3	17.56492
8.6	18.50515

(a) Estimate $f(8.4)$ using Lagrange polynomials via Neville's method.

(b) Given the additional data point $(8.2, 17.25390)$, estimate $f(8.4)$ again using Neville's method to include the additional data point. In doing this, do only necessary computations (i.e., build on the computations you did in the last part).

(c) How many digits of accuracy do you expect in your answer in part (b)? Why?

15. Suppose in addition to the above, you knew that the derivatives of the function were as given below. Construct the Hermite polynomial for the function.

x	y	y'
8.1	16.94410	3.091864
8.3	17.56492	3.116256
8.6	18.50515	3.151762

Suppose a floating point system has a 2-bit mantissa and 2-bit exponents, where the exponent stored in binary is shifted by 2 (so that a binary exponent stored as 11 represents an exponent of 1). The binary number is stored as a sign bit, the exponent, and then the mantissa. What is the binary encoding of the floating point approximation for 2.25? (assume round to nearest, ties break to even).