Numerical Analysis

Math 370 — MWF 2:30-3:25
Spring 1997 — 127 Fowler

(03.26.97) Report on EXAM 2

Point Distribution (N=16)

Range	92+	89+	86+	82+	79+	79-	40-
Grade	A	A-	B+	B	B-	D	F
Frequency	10	2	0	0	1	1	2

Comments

Overall As I claimed in email, this was not a difficult exam. It may have taken you longer than expected to complete it. For that, I apologize, but it is very difficult to predict how long you will take to complete the exam and I think people did it slower than usual because they knew that I would let them take as long as they wanted. People who did complete it, basically got everything correct. The mode was a 99! The median was 95.

#1 Lagrange Polynomials. This was a very straightforward problem to see whether you knew how to write down Lagrange polynomials of a particular degree for a given set of nodes, and then use those polynomials to derive the interpolating polynomial. Most people got this completely correct, as long as they started with the correct formulas!

#2 Newton Polynomials. This is almost identical to the first problem, except that this time I'm testing your familiarity with divided differences and how they are used to compute the Newton form of the interpolating polynomial.

#3 Cubic Splines. This question is to see how much you understand about how a cubic spline is defined, and then how one would actually compute one. The point is to write down the equations in a form that could be given to a matrix solver. So once you have identified the unknown parameters everything else in the equations should be finite numbers.

#4 Approximation Theory. This is an example is using the formulas for finding the line of best fit when instead of a linear relationship, some kind of exponential or power relationship exists between x and y. So, one has to transform the given data and used the transformed data to compute the "best fit" parameters.

#5 Error Bounds. This was the question which people had the most problem with. The main problem was that people did not have a clear idea of what $\xi(x)$ **is** and didn't understand why or how one computes M, the bound for $f^{(n+1)}(\xi(x))$. The essay question was answered well by most people in that they said that the Newton and Lagrange errors will be the same, because the Newton and Lagrange polynomials are the same. The error at $x = 0.5$ is smaller than the error at $x = 2$ because one is interpolation and the other is extrapolation. One can also compute the theoretical error bound at $x = 2$ (you need to re-compute M though) and you'll see that the theoretical error bound at $x = 2$ is nuch larger than at $x = 0.5$ which explains why interpolation is more accurate than interpolation. The actual error must always be less than the theoretical error bound.