V63.0252 Numerical Analysis Spring 2007
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Course home page URL: http://www.math.nyu.edu/courses/spring07/V63.0252-001/index.html
Office hours: Mondays 3:30–4:30pm and Thursdays 4:00–5:00pm.
Homework set 5: Due Monday April 16, at midnight.

No homework will be accepted after that time.

Homework should be given to me in class or put under my office door. Do not put it in my mail box. For general rules, read my home page.

Four MATLAB primers are now available via the course homepage. Xiaoyu Wang (xiaoyu@cims.nyu.edu) can also assist you in learning the basics.

When running matlab, use **format long e**.

Recall the function

$$f(x) = 1/(1 + 25x^2), \quad x \in [-1, 1].$$

which was featured prominently in the previous homework set.

1. Write a program that provides a natural cubic spline interpolant of any function and test it on $f(x)$. Try both equidistant and Chebyshev points. Estimate the error in the two cases. Is there an appreciative difference? Note that natural cubic splines have vanishing second derivatives at the end points of the interval.

   In your program, you will need a solver for tridiagonal, symmetric, positive definite systems of equations. I believe, you can find such a program at the website
   http://www.mathworks.com/moler/ncmfilelist.html

2. Discuss and compare the quality of the approximation obtained by cubic splines, piecewise cubic Hermite, and polynomial interpolation.

3. Run your spline program using 1000 or more interpolation points. Comment on the performance.

4. Find out what is available for cubic spline interpolation in matlab. Try to compare the output from your program with that of the matlab system.