

Homework 4, due to March, 6, 2006

All exercise numbers refer to the book ‘Numerical Linear Algebra’ of Trefethen and Bau.

Problem 1: Solve exercise 12.1

Problem 2: Solve exercise 12.3

Problem 3: Solve exercise 13.3

Problem 4: Solve exercise 15.2

Problem 5: Consider the function

$$f(x) = \frac{1 - \cos x}{x^2}.$$

Evaluate and plot the function on the range $[-4e-8, 4e-8]$ with grid spacing $1e-10$ (you get 801 grid points). This function should be about $1/2$ across this interval. Where does the deviation come from? In particular, compare $f(x)$ at $x=1.1e-8$ and at $x = 2^{-24}$. Explain the so called *catastrophic cancellation* in one case and the quite accurate result in the other.