Math 441, Introduction to Numerical Analysis
Fall 2006

Homework 4

due Tuesday, October 3

A. Read: Sections 3.1, 3.2.

B. Hand in:

1. page 79, exercises 4, 8 (a,b,c).
2. page 90, exercises 5, 6, 17 (e) (hint: $\lim_{n\to\infty}(1+\frac{1}{n})^n = e$).

C. Matlab assignment:

3. Solve the equation $f(x) = 0$, with $f(x) = x^2 - \cos x$, using both Newton's method and the bisection method. Use the provided codes if necessary. The Matlab functions contain a tolerance $\delta > 0$ as an argument. In order to properly compare the two methods use as stopping criteria the *absolute error* test, that is, your procedure stops if $|f(x)| < \delta$, or a given (large) number of iterations has been performed (in order to prevent entering an infinite cycle). Test the methods against each other for a few δ values of your choice (suggested: $10^{-3}, 10^{-6}, 10^{-9}, 10^{-12}$). Verify that for small δ Newton's method converges to the solution much faster than the bisection method. **Show printouts of your codes and results.**

4. Solve the equation $F(x, y) = (0, 0)$ with
$$F(x, y) = (e^x \cos y, e^x, \sin y) - b$$
(b is a vector!) using the provided Matlab functions for Newton's method (`g1.m`, `dg1.m`). Try $b = (10, 1), b = (10, 10)$, and various (meaningful) initial conditions. Does the algorithm always converge? Present you results in a short paragraph (include numbers, the reader should be able to reproduce your answers).

5. page 92, exercise 7.