Homework 8 Foundations of Computational Math 1 Fall 2012

Problem 8.1

Textbook, page 330, Problem 6

Problem 8.2

Consider the system of equations in $\mathbb{R}^2$

$$\xi^2 + \eta^2 = 4$$
$$e^\xi + \eta = 1$$

The system has two solutions in $\mathbb{R}^2$, one with $\xi > 0$ and $\eta < 0$ and one with $\xi < 0$ and $\eta > 0$.

(8.2.a) Derive the iteration for Newton's method to solve the system of two nonlinear equations above.

(8.2.b) Implement it and consider the performance for a variety of initial conditions to solve the system of two nonlinear equations above.

(8.2.c) Derive an iteration using Nonlinear Jacobi-Newton (one-step) to solve the system of two nonlinear equations above.

(8.2.d) Implement it and consider the performance for a variety of initial conditions to solve the system of two nonlinear equations above.

(8.2.e) Derive an iteration using Nonlinear Gauss-Seidel-Newton (one-step) to solve the system of two nonlinear equations above.

(8.2.f) Implement it and consider the performance for a variety of initial conditions to solve the system of two nonlinear equations above.

(8.2.g) Compare to the work required to achieve a given accuracy Nonlinear Jacobi-Newton and Gauss-Seidel-Newton, and Newton's Method when starting at the same initial condition? Also compare to iterations 1 and 2 in the latest programming assignment.

Note you do not have to turn in any implementation. This is not a programming assignment.