MATH 923 — PROJECT 4

Report by Wednesday, November 19, 1997

⇒ Note: Project 3 is now also due on November 19.

Write a program implementing the Broyden update for solving the system of nonlinear equations

$$F(x) = 0.$$

You may start with the exact Hessian at your initial guess, or a finite-difference approximation, or anything else "reasonable".

Test your program on a system whose solution you know (one linear and one nonlinear example).

Problem 1 Use your program to find solutions to the equations in Project 3.

$$\begin{aligned}
ye^{w+x} &= 2xz \\
w+x+y+z &= y^2 - z^2 \\
wxyz &= x - 3 \\
\frac{1}{w+y} + \frac{2}{x+z} &= y.
\end{aligned}$$

and of the system

$$\begin{aligned}
x_1 x_3 - x_2 - x_4^2 &= 1.97 \\
x_3 \sin x_1 - \sqrt{x_4} &= 17.969667 \\
x_2 - 2e^{x_1} &= -0.0201 \\
x_1 x_4 + \frac{x_2}{x_3 + 3} &= 0.041
\end{aligned}$$

Explore various initial guesses. Comments on Broyden vs. minimization techniques of Project 3.