MAT 362 Spring 2007 Programming assigment 4: Multivariable Newton method Name:

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Hours: MW 10:10-12:10, F 10:10-11:10

Write a program implementing the multivariable Newton method. Use your program to find as many solutions of the following system as possible:

$$\begin{aligned} \cos(x)y - 2z + 10 &= 0 \\ z - y^2x + 10 &= 0 \\ e^{x-z} - 20 &= 0 \end{aligned}$$

At each iteration print the number of iterations the estimate for the root and the value of the function at this estimate.

Turn in:

- This problem sheet with your name.
- A summary sheet explaining what you did, how you approached the problem, what was accomplished, what was not accomplished, etc.
- A table showing solutions, initial guesses and the number of iterations.
- A formula for the Jacobian matrix.

Website:

- Create a directory called `4multinewton` on your web site and make all your input, output and source files available in this directory. Write the url for the website on this problem sheet.

Hints:

- To avoid huge amount of output, choose initial guesses that do not require too many iterations. Do not use more than one decimal place to create these initial guesses.
- When you define a function that implements $f : \mathbf{R}^3 \to \mathbf{R}^3$, make the input variable have type `Trow`. The function should also return type `Trow`. The Jacobian takes an input of type `Trow` and returns type `Tmatrix`.
- Use your code from the Gauss elimination project to solve linear systems of equations. Put this piece of code into a separate source file called `linsyssolve.cc`. Create a header file `linsyssolve.h` that you can include in your main source file.
- Use `matrix.cc` and `matrix.h` to implement generic matrix operations (scalar multiple, sum, norm printing, reading).
- You need to compile all your source files together `g++ multinewton.cc matrix.cc linsyssolve.cc`.
- To simplify your work, write a go script that compiles and runs your code.
- Use absolute tolerance 10^{-15} for the norm.