Math 3620 Machine Problem 7: Due 3/10

1) Write a computer code to carry out the Newton method for finding solutions of the following system $F(x, y, z) = 0$ of nonlinear equations:

$$\begin{aligned} x + y + \cos(z) &= 0 \\ x^2 + y^2 + z^2 &= 2 \\ \sin(x)(y + z) &= -1 \end{aligned}$$

The code should

a) read a start vector from the screen

b) do a maximum of 20 iterations

c) for each step, print the step number, $\|h\|_\infty$ and $\|F(x, y, z)\|_\infty$.

d) stop the iteration if $\|h\|_\infty < 10^{-6}$ or $\|F(x, y, z)\|_\infty < 10^{-6}$.

e) Print out your solution when the iteration stops

f) You should use calculus to find the formulae for the Jacobian matrix. Be careful to get these correct.

2) Solve this system starting with the vector $(1, 1, 1)^T$.

3) The following system has several solutions. Experiment with different starting vectors to find three of them. Print out the same information as before.

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

Turn in a complete listing of your code along with the output for all runs.