CS CM186 Lab 3 Report

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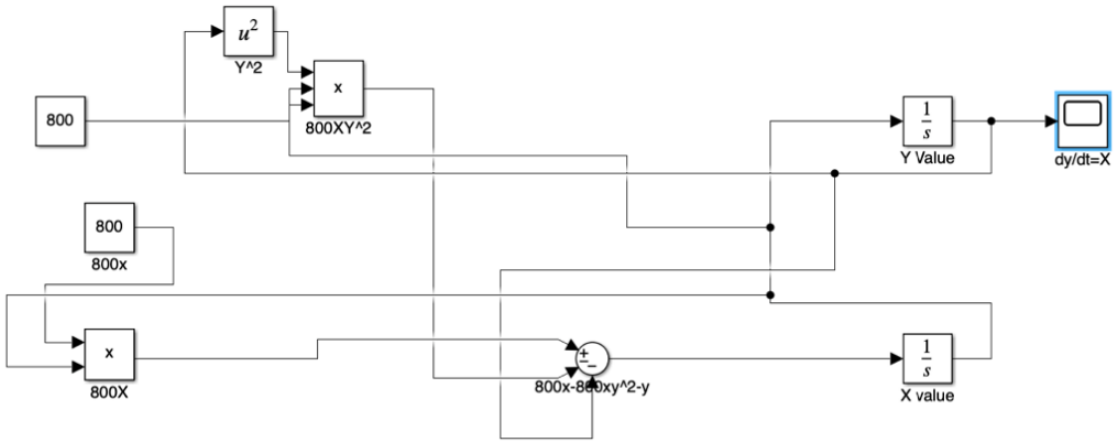
This section of written work was completed on my own

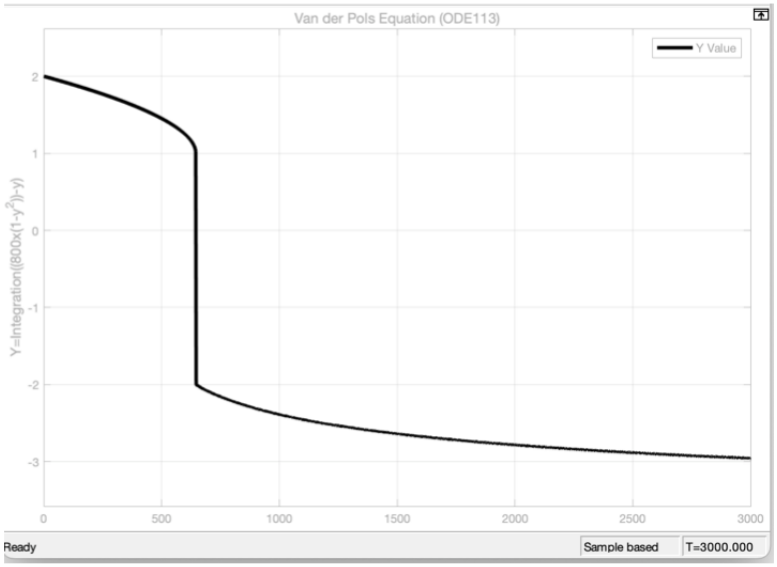
1)

The Nonstiff solvers performed the best.

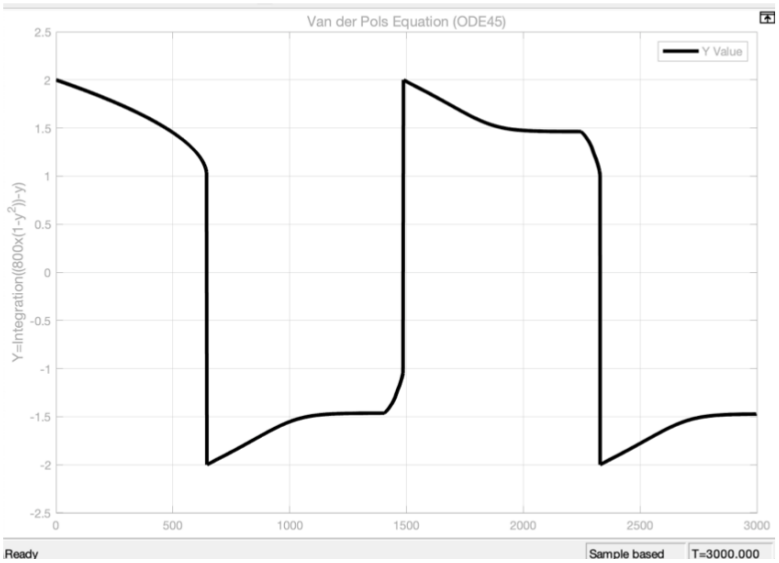


a) Non Stiff ODE Solvers (ODE 45 ODE 113)

ODE 113 Total Steps = 1497455

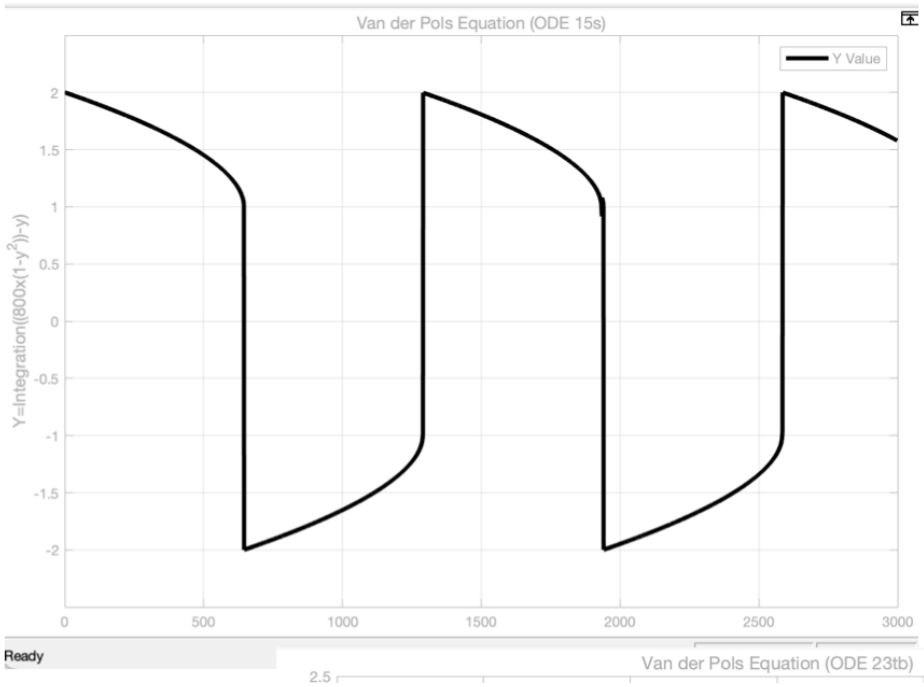


ODE 45 Total Steps = 1022416

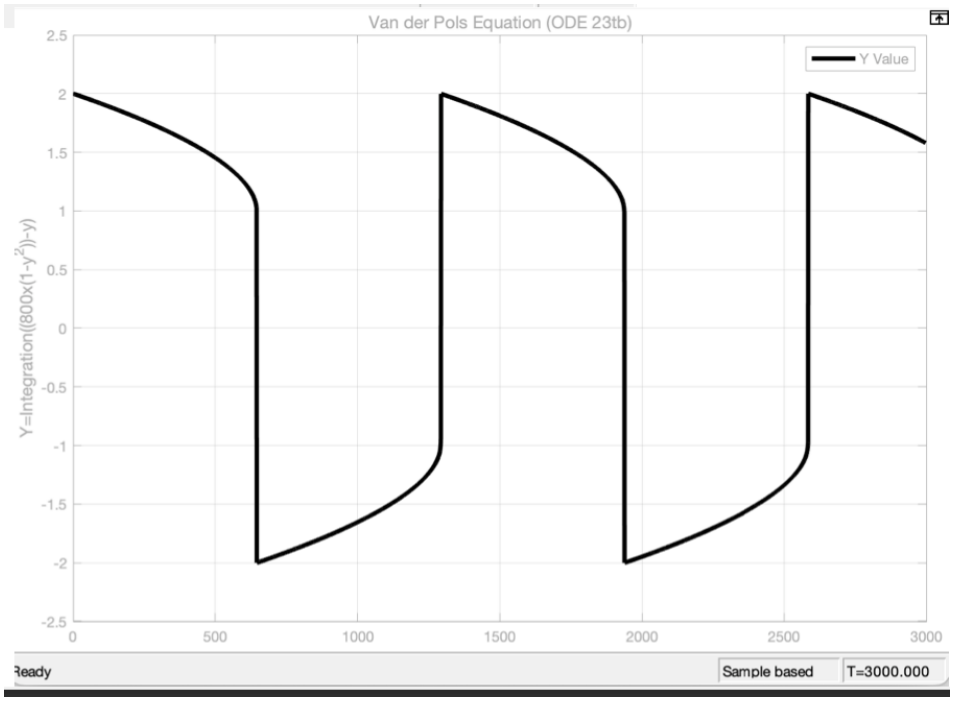


b) Stiff ODE Solvers

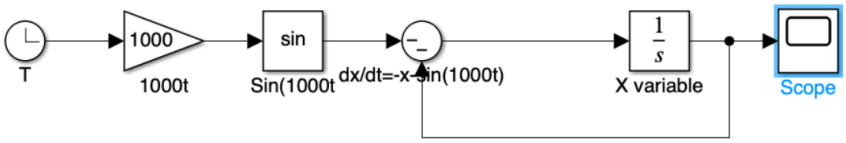
ODE15 Total Steps = 15295

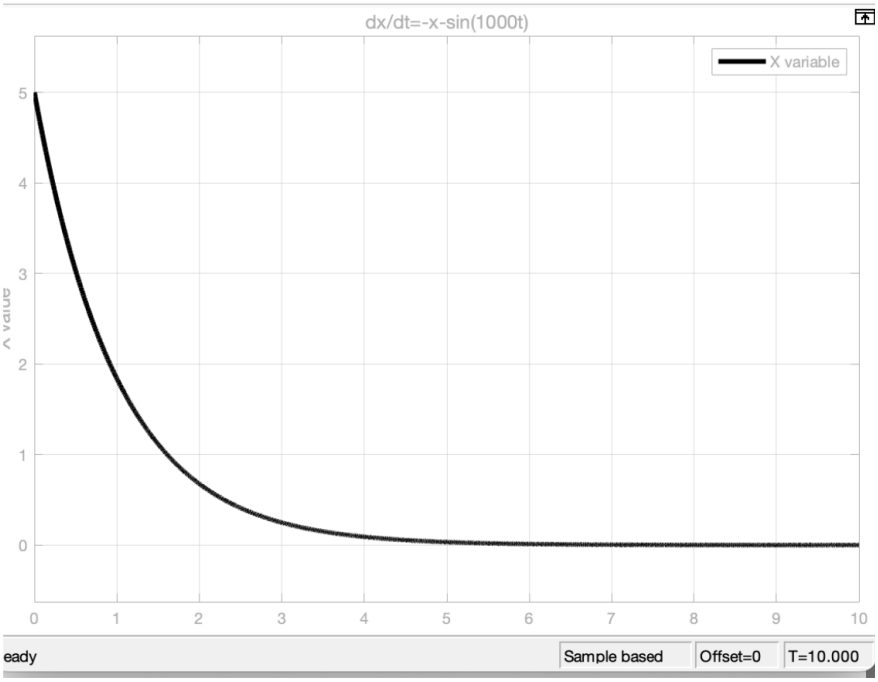


ODE 23tb Total Steps = 15243

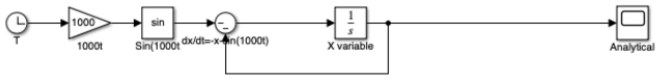


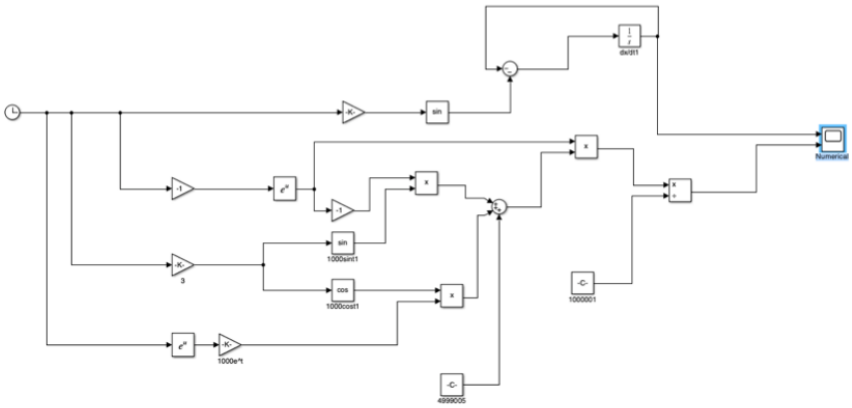
2)

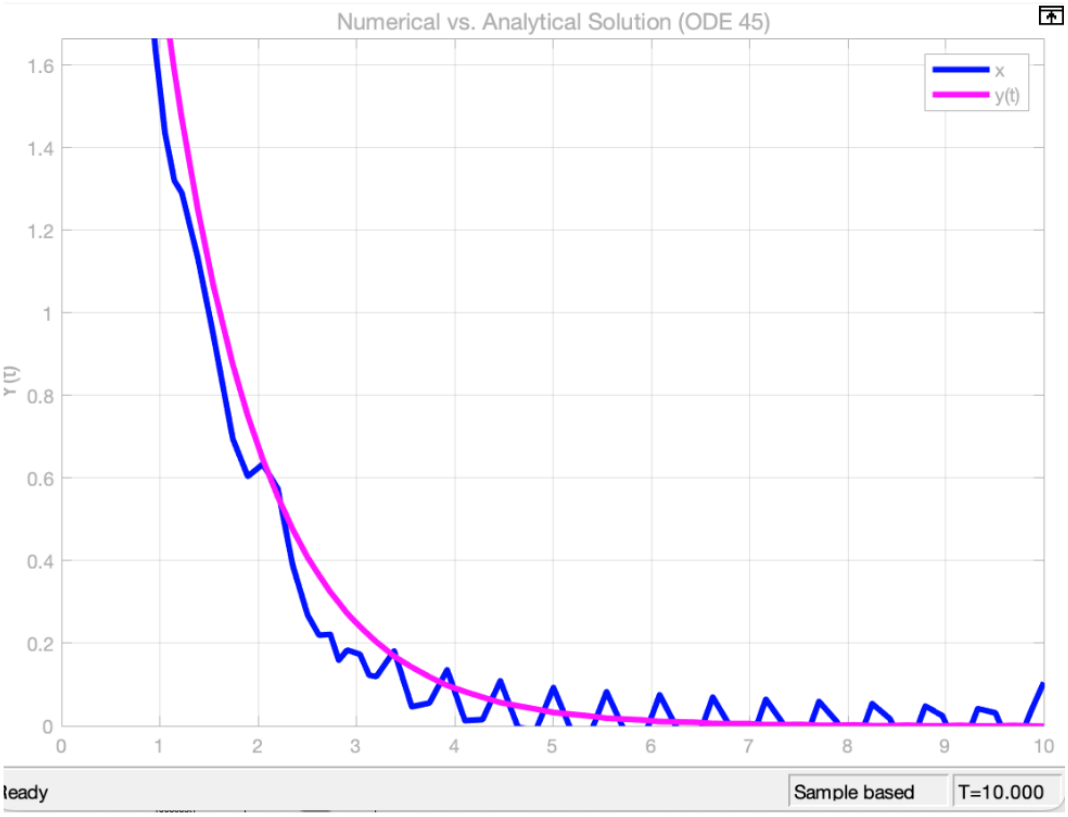

T
1000
1000t
sin
Sin(1000t
dx/dt=-x-sin(1000t)
1
s
X variable
Scope


dx/dt=-x-sin(1000t)
X variable
5
4
3
2
1
0
0
1
2
3
4
5
6
7
8
9
10
eady
Sample based
Offset=0
T=10.000

3)

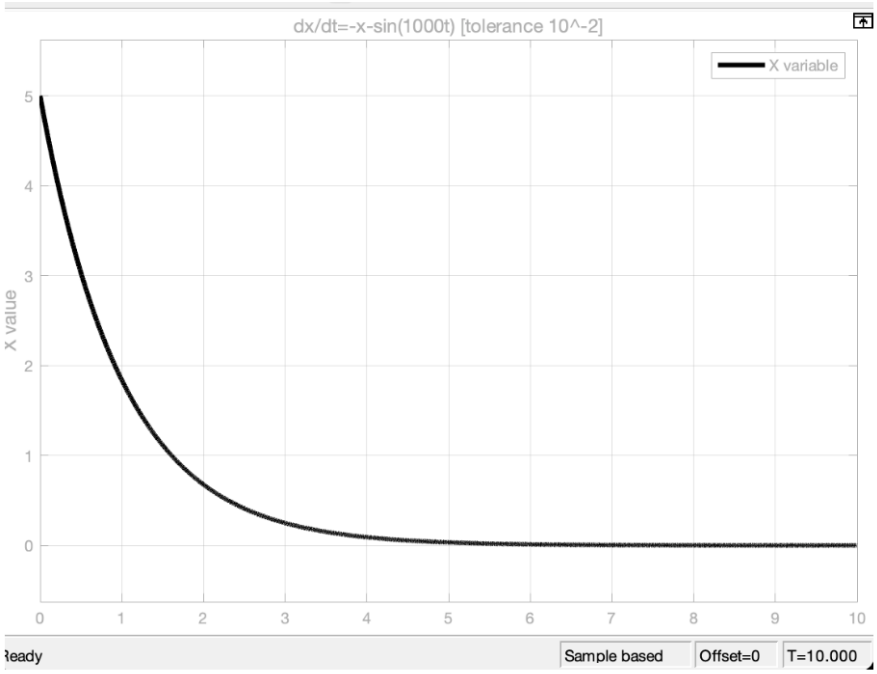




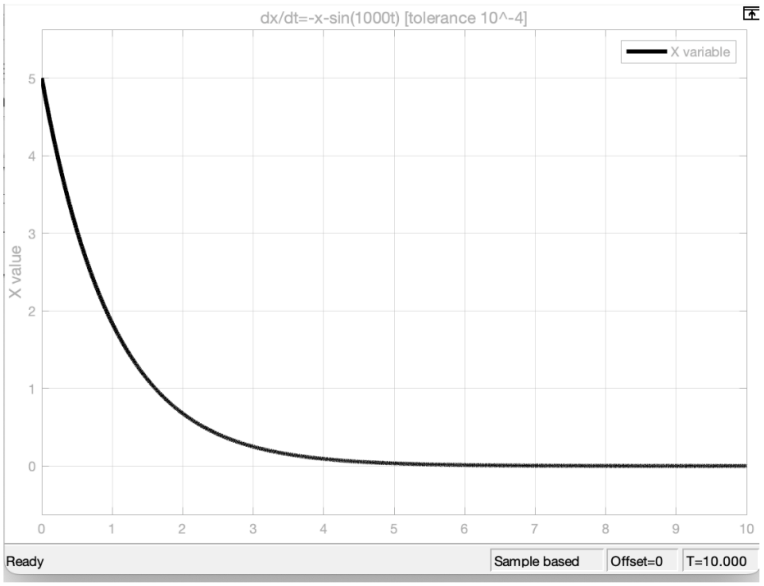


The analytical solution approaches the correct numerical solution due to the fact that the graphs converge on the same value.

4) Tolerance 10^-2



Tolerance 10^-4



Changes in the result are that lower tolerance errors are correlated with fewer steps and a decreased runtime (7200 > 7196).
Disadvantages of a smaller error is that with tighter tolerance, divergence from the solution may occur since errors are accumulated per step.