

CS CM 182 Lab 8

Name : Sum Yi Li

Student ID : 505146702

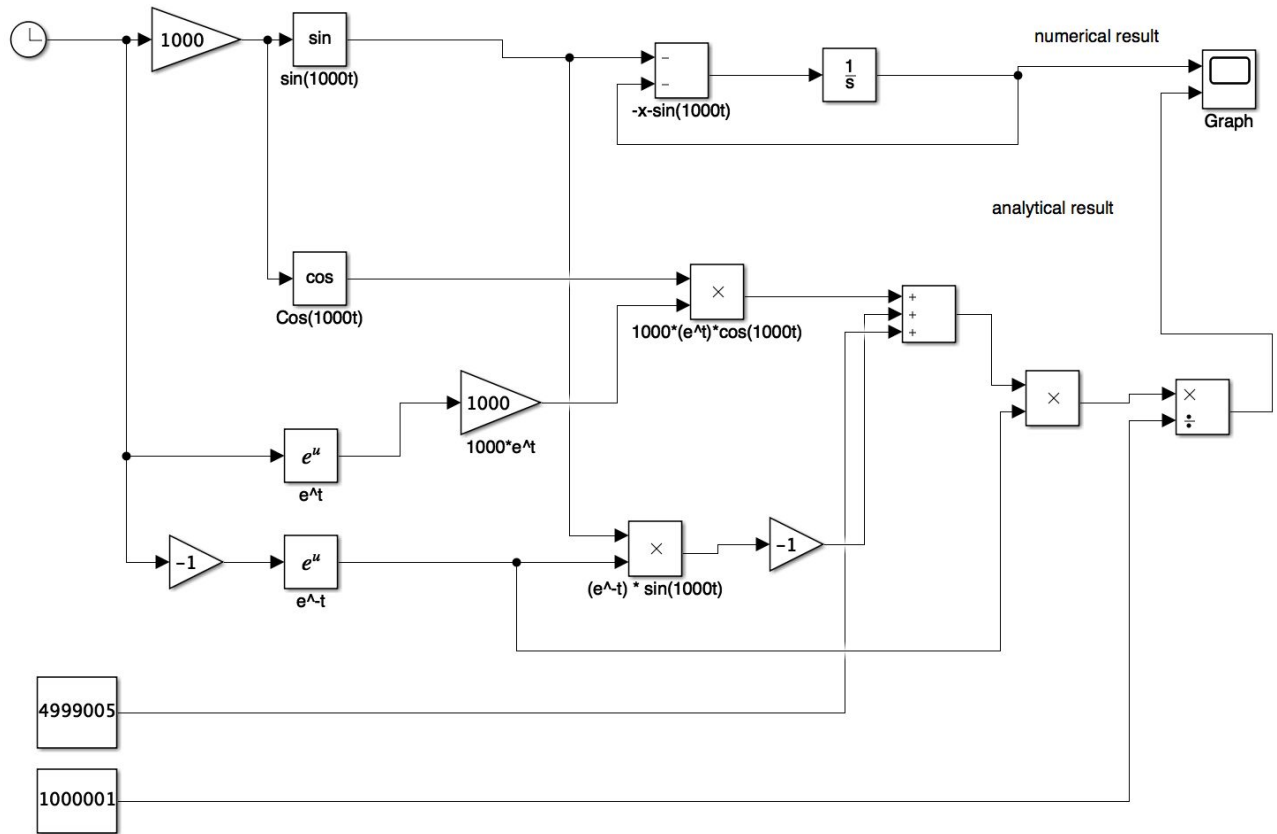
I completed this written part of the homework, lab report, or exam entirely on my own.

A handwritten signature in blue ink, appearing to read 'Sum Yi Li'.

Exercise 1 - No need to show plots

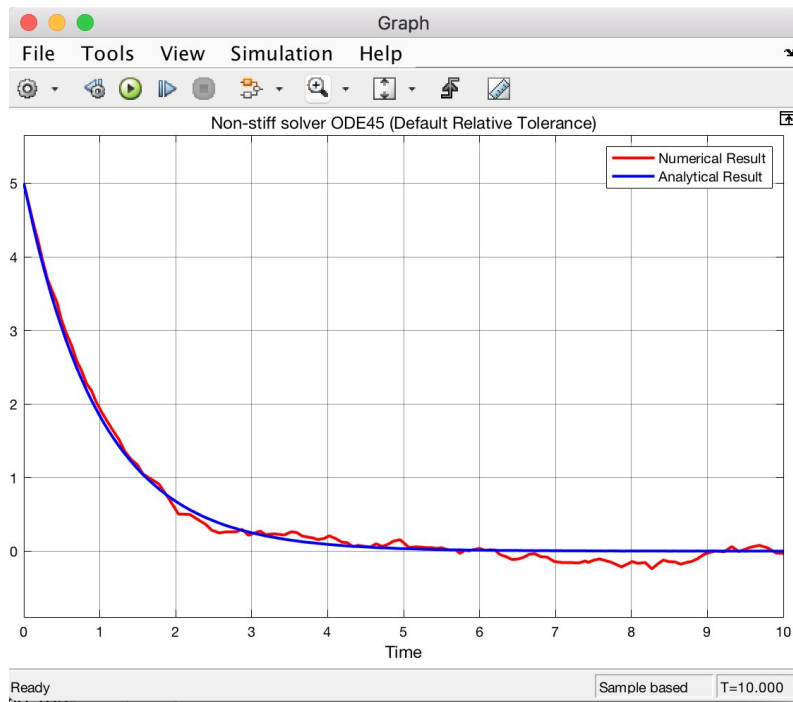
Exercise 2

Simulink

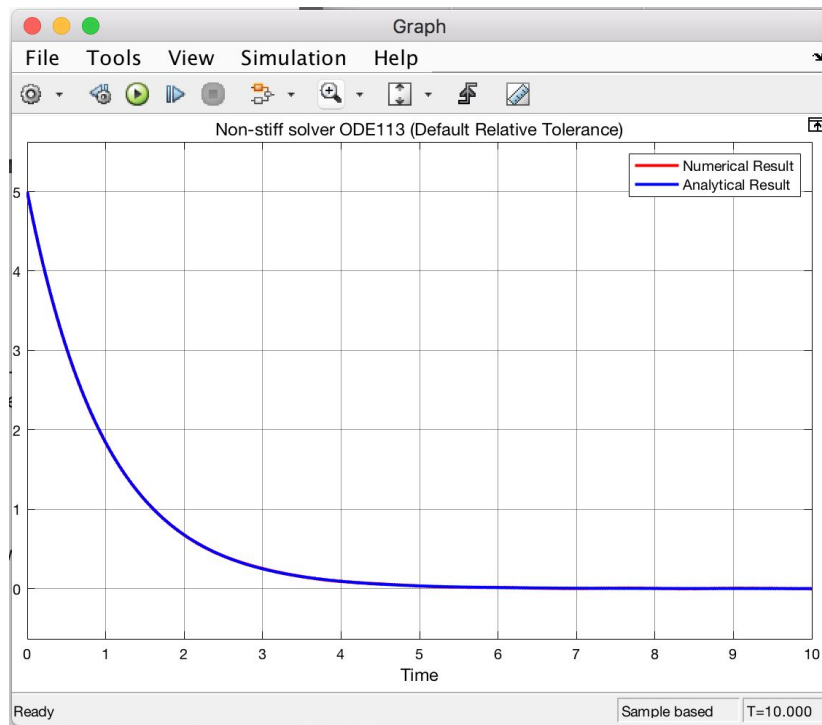


Relative error tolerance (default): 10^{-3}

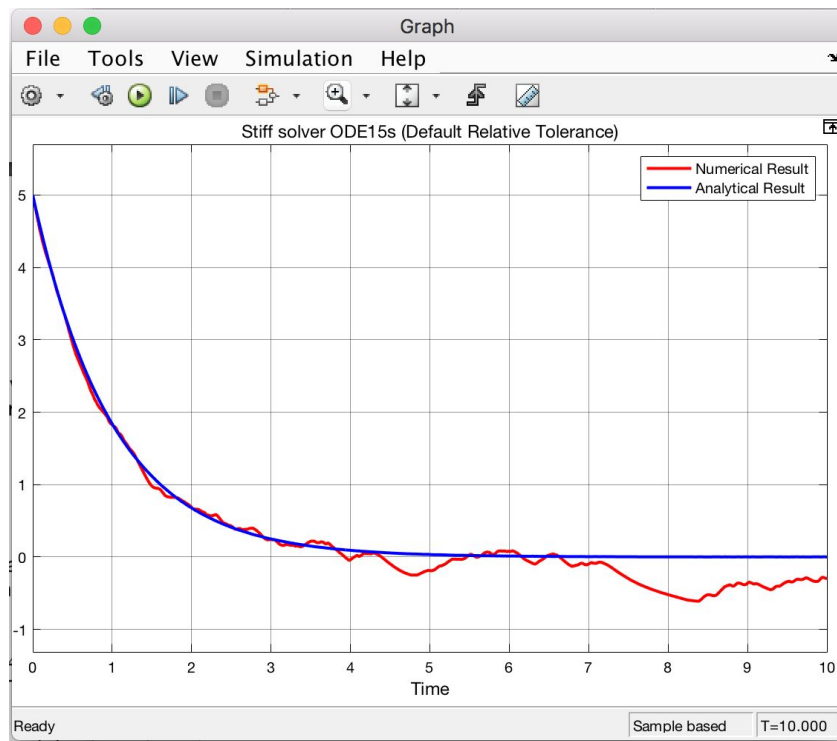
1. Non-stiff solver ODE 45



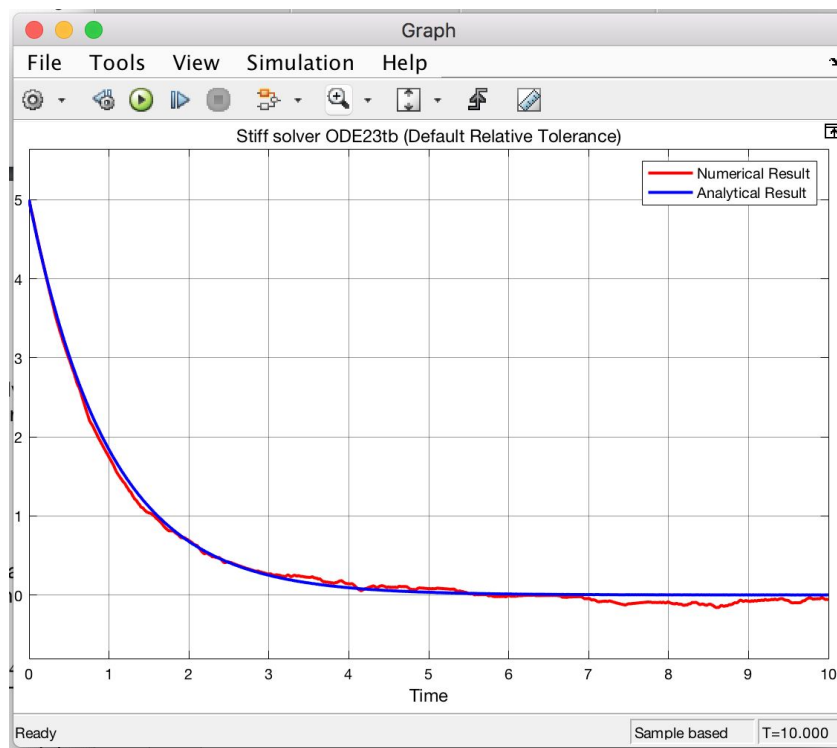
2. Non-stiff solver ODE 113



3. Stiff solver ODE 15s



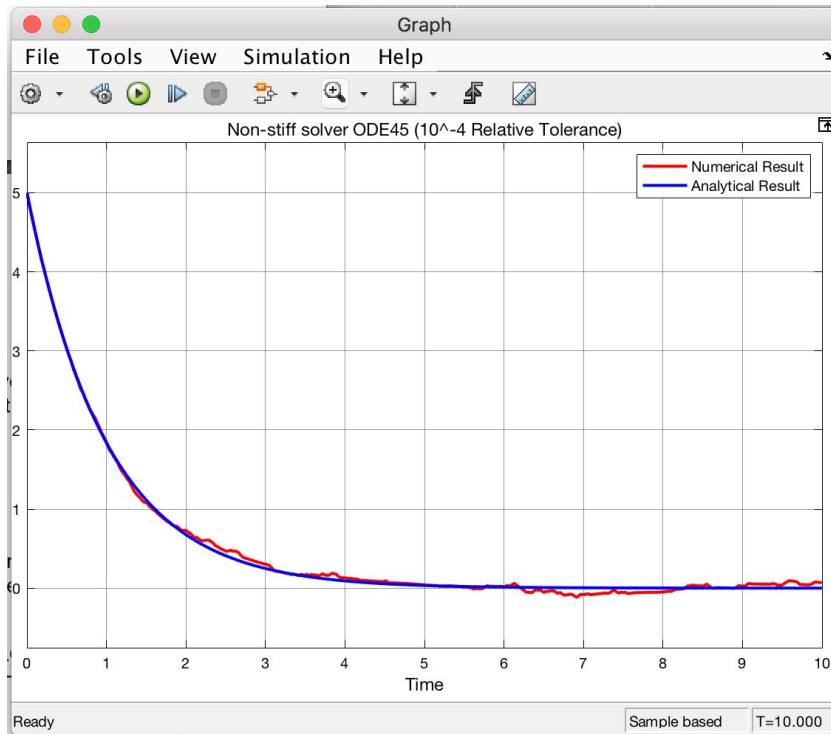
4. Stiff solver ODE 23tb



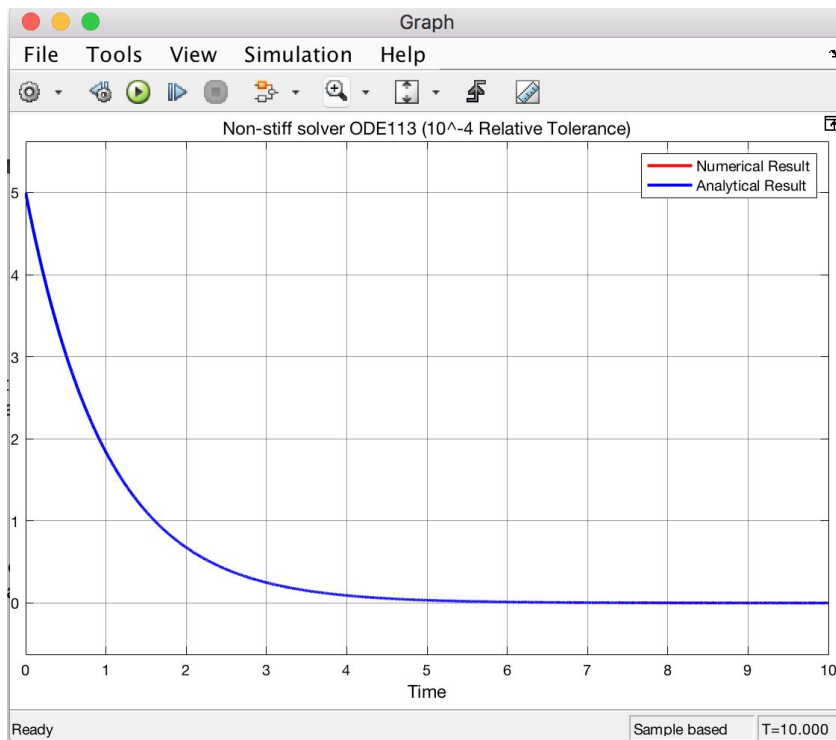
Exercise 3

Relative error tolerance: 10^{-4}

1. Non-stiff solver ODE 45

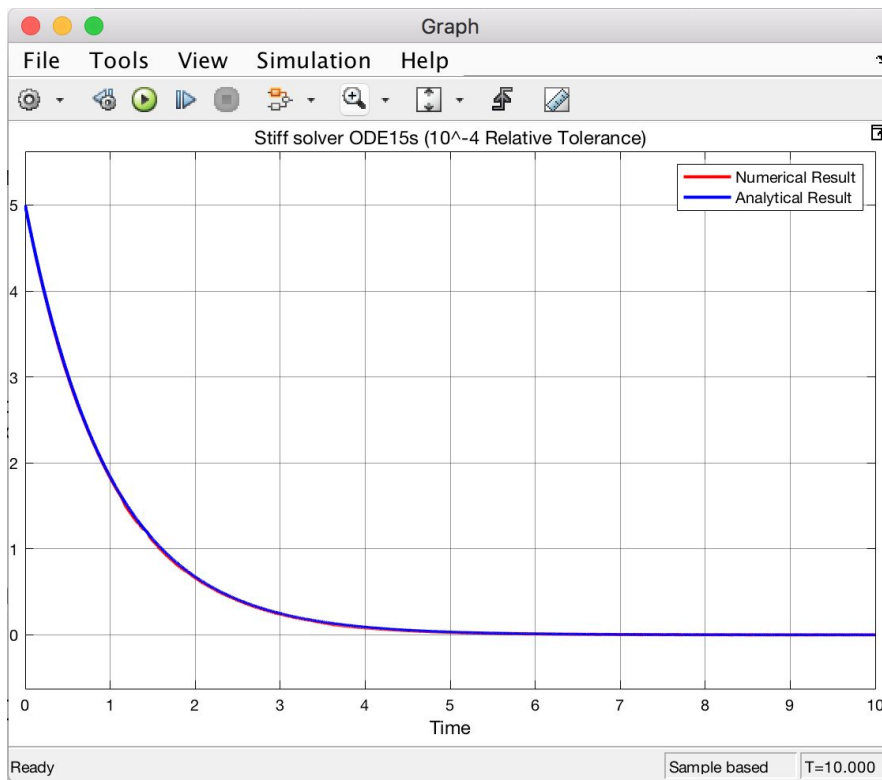


2. Non-stiff solver ODE 113

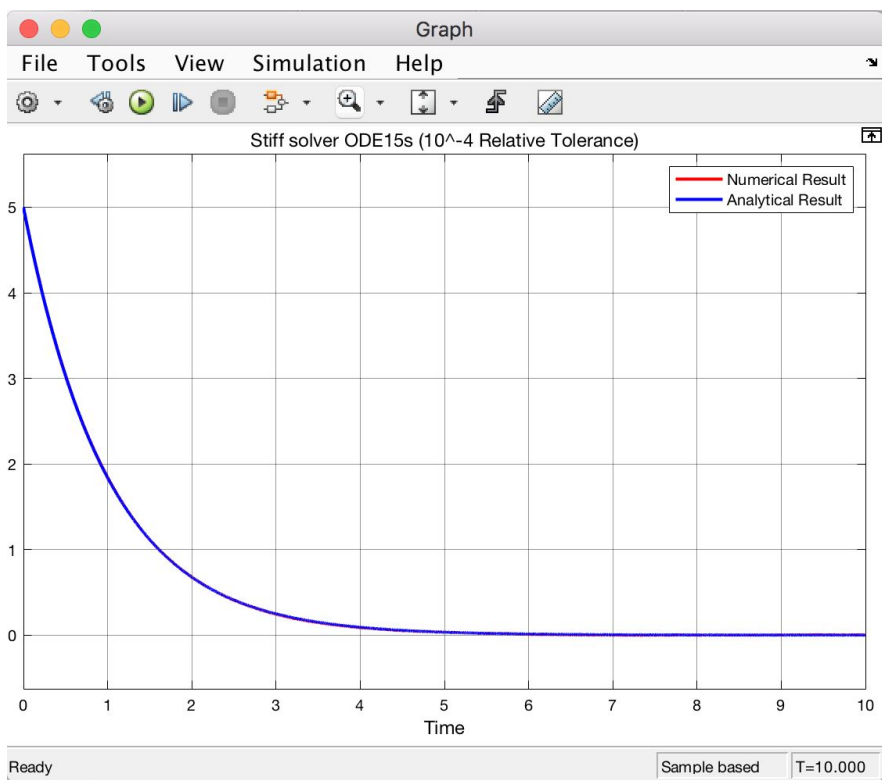


Relative error tolerance: 10^{-4}

3. Stiff solver ODE 15s

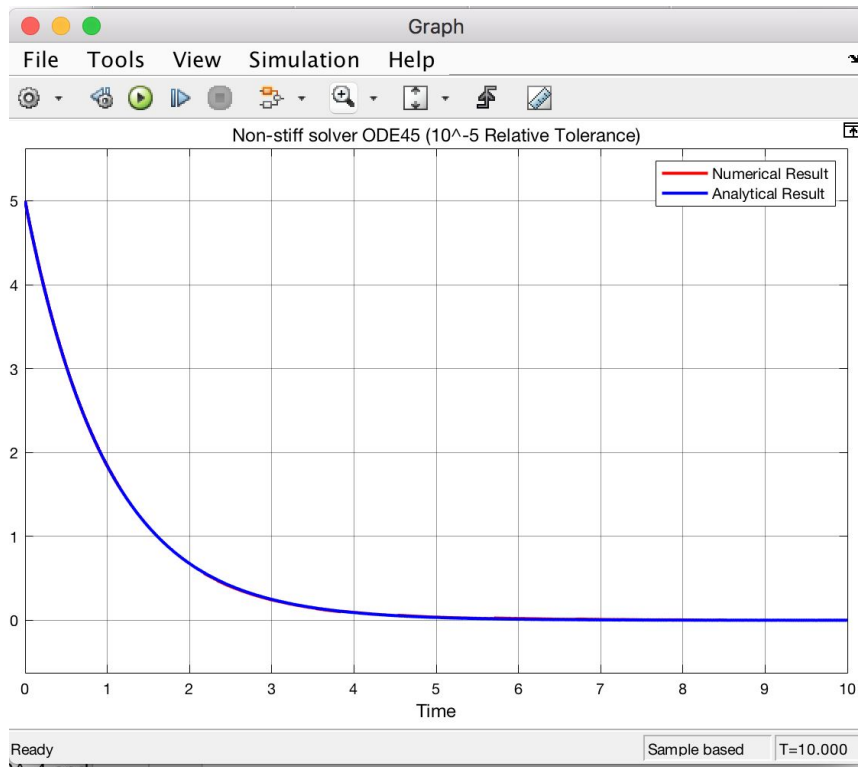


4. Stiff solver ODE 23tb

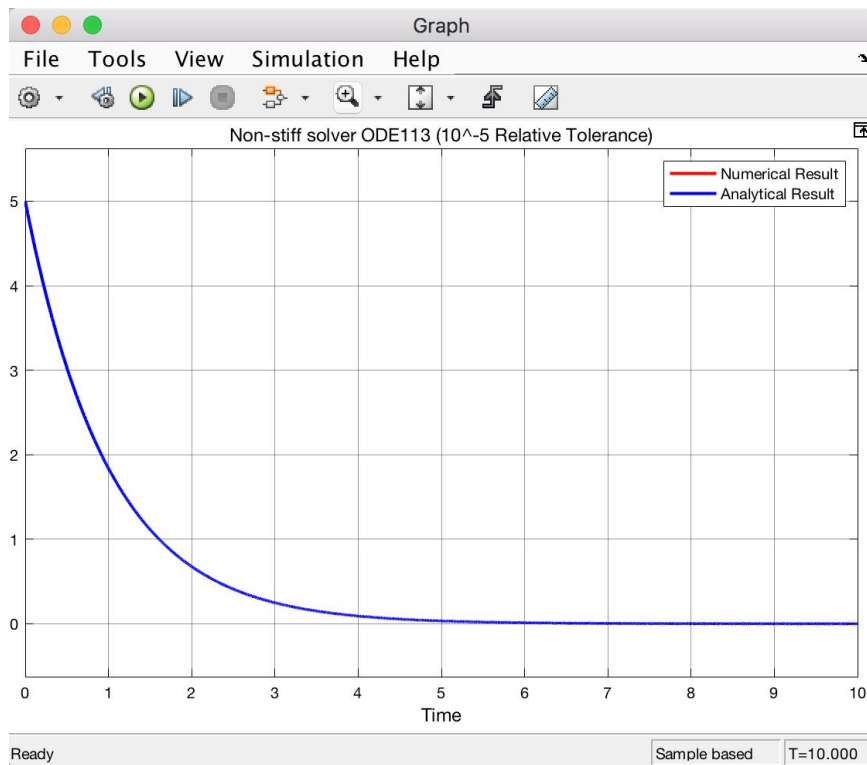


Relative error tolerance: 10^{-5}

1. Non-stiff solver ODE 45

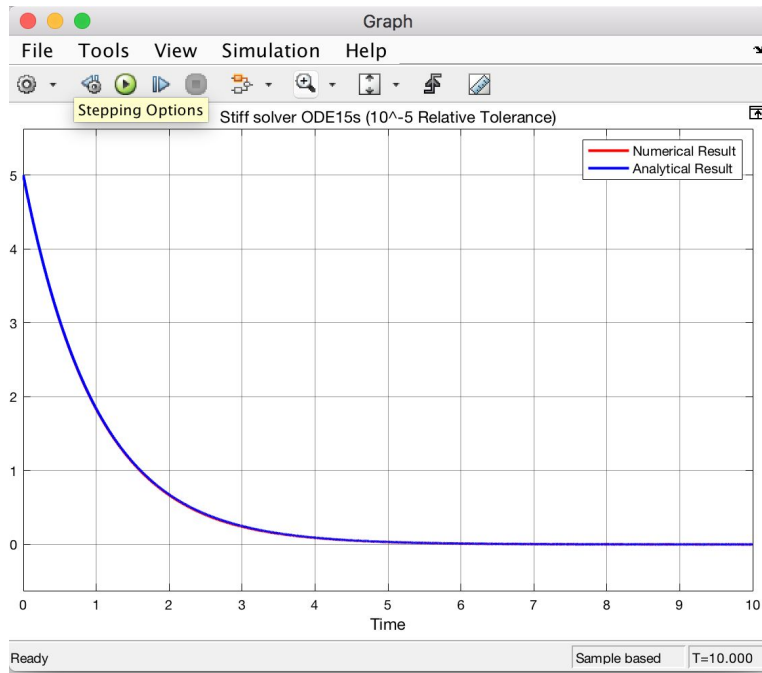


2. Non-stiff solver ODE 113

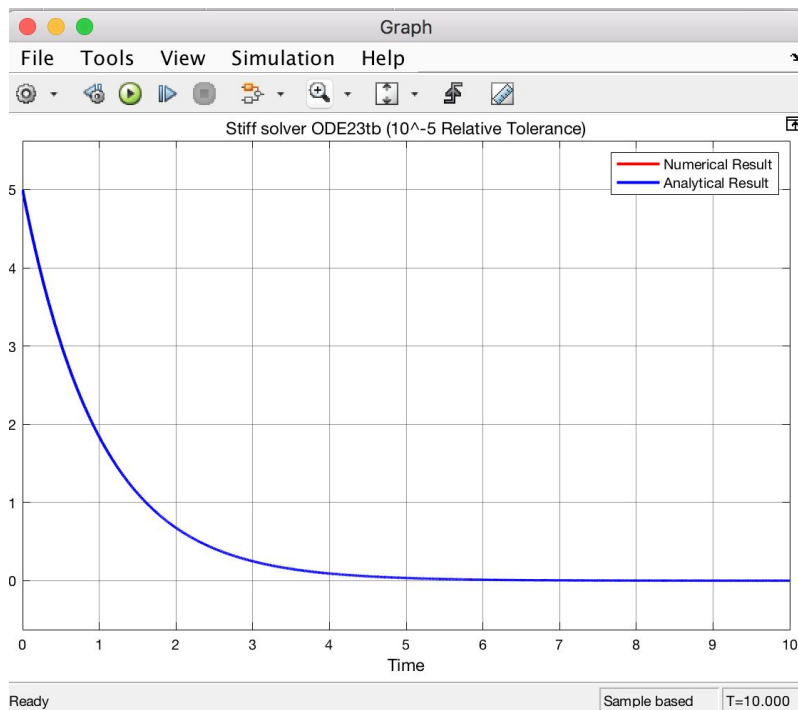


Relative error tolerance: 10^{-5}

3. Stiff solver ODE 15s



4. Stiff solver ODE 23tb



Exercise 4

When the relative tolerance level is at 10^{-3} , non-stiff solver ODE 113 produced the best solution.

When the relative tolerance level is at 10^{-4} , both non-stiff solver ODE 113 and stiff solver ODE 23tb produced the best solution.

When the relative tolerance level is at 10^{-5} , all four of the solvers which are non-stiff solver ODE 45, ODE 113 and stiff solver ODE 15s and ODE 23tb produced the best solution.

The disadvantages of making the relative error tolerance small is it will lower and spoil the efficiency of the computation by taking a longer time to run the solver to solve the given ODE equations despite being more and more accurate. It is because taking small steps to predict one point takes longer to further predict other points at a later time.