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MSQT 20246721

Module 4 Solutions

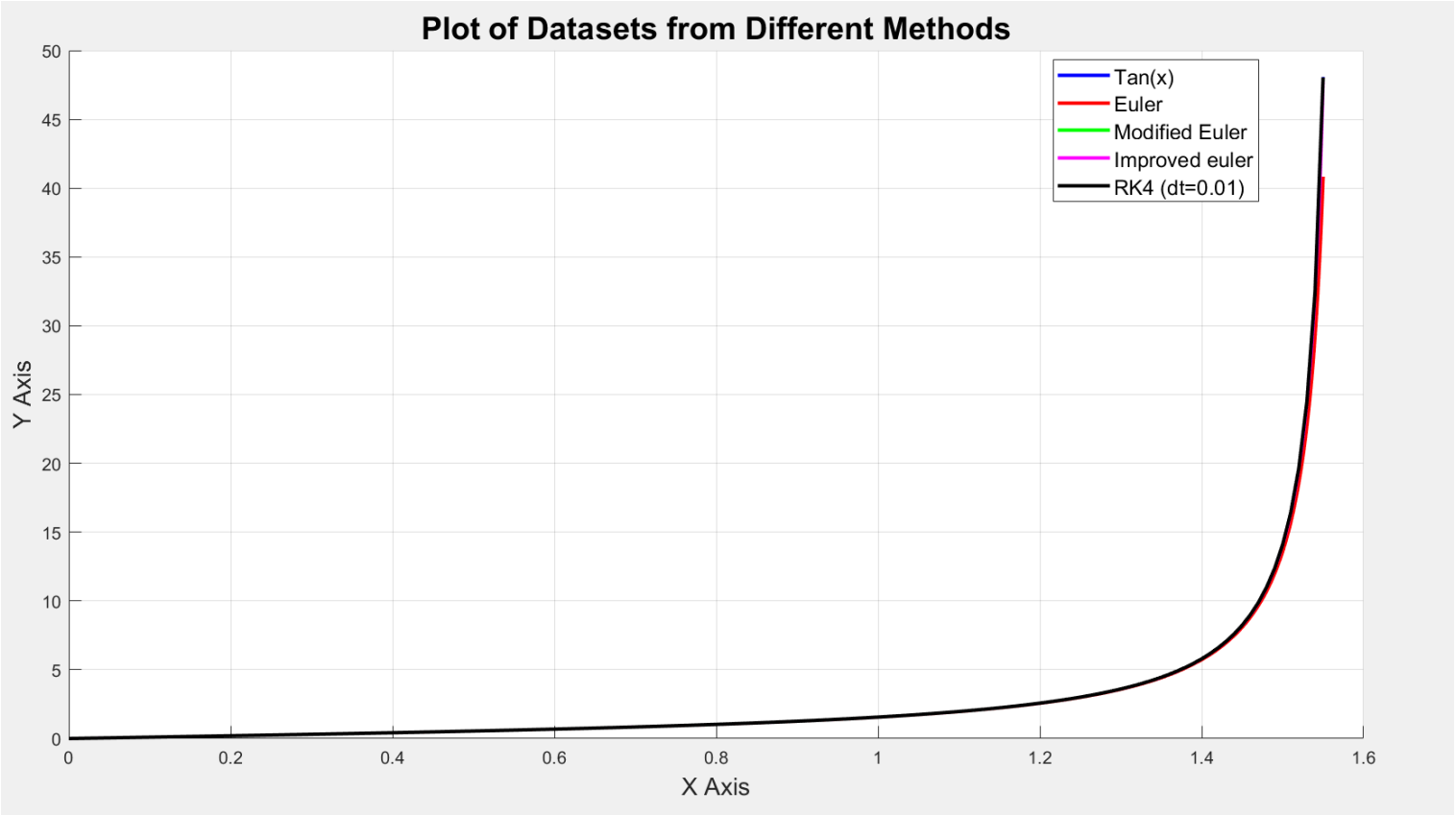
Q.1 The value of the difference yA – yE at x=1.550 is: 5.5795205870973135

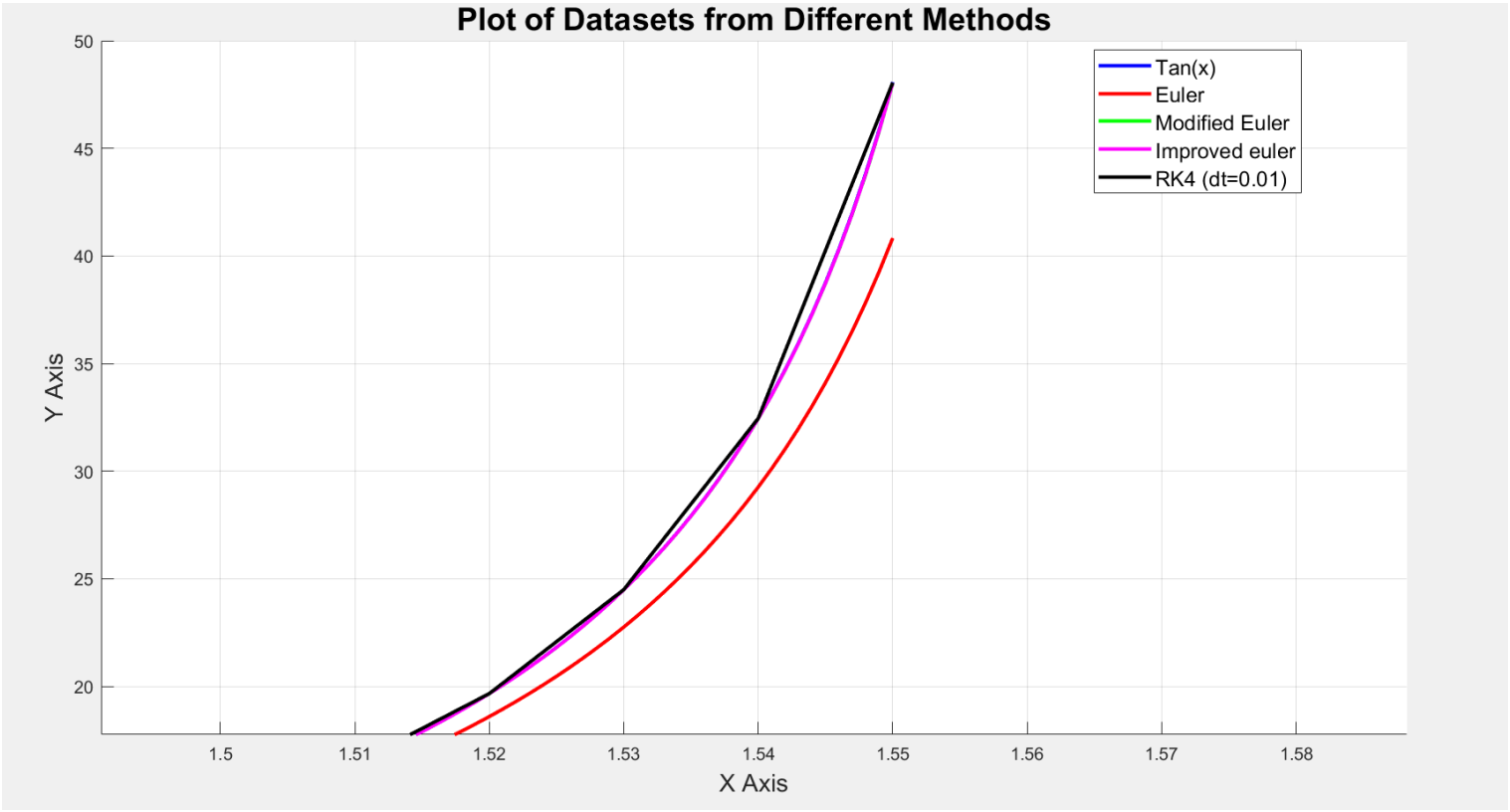
Q.2 The value of the difference yA – yME at x=1.55 is: 7.7053728980175151E-002

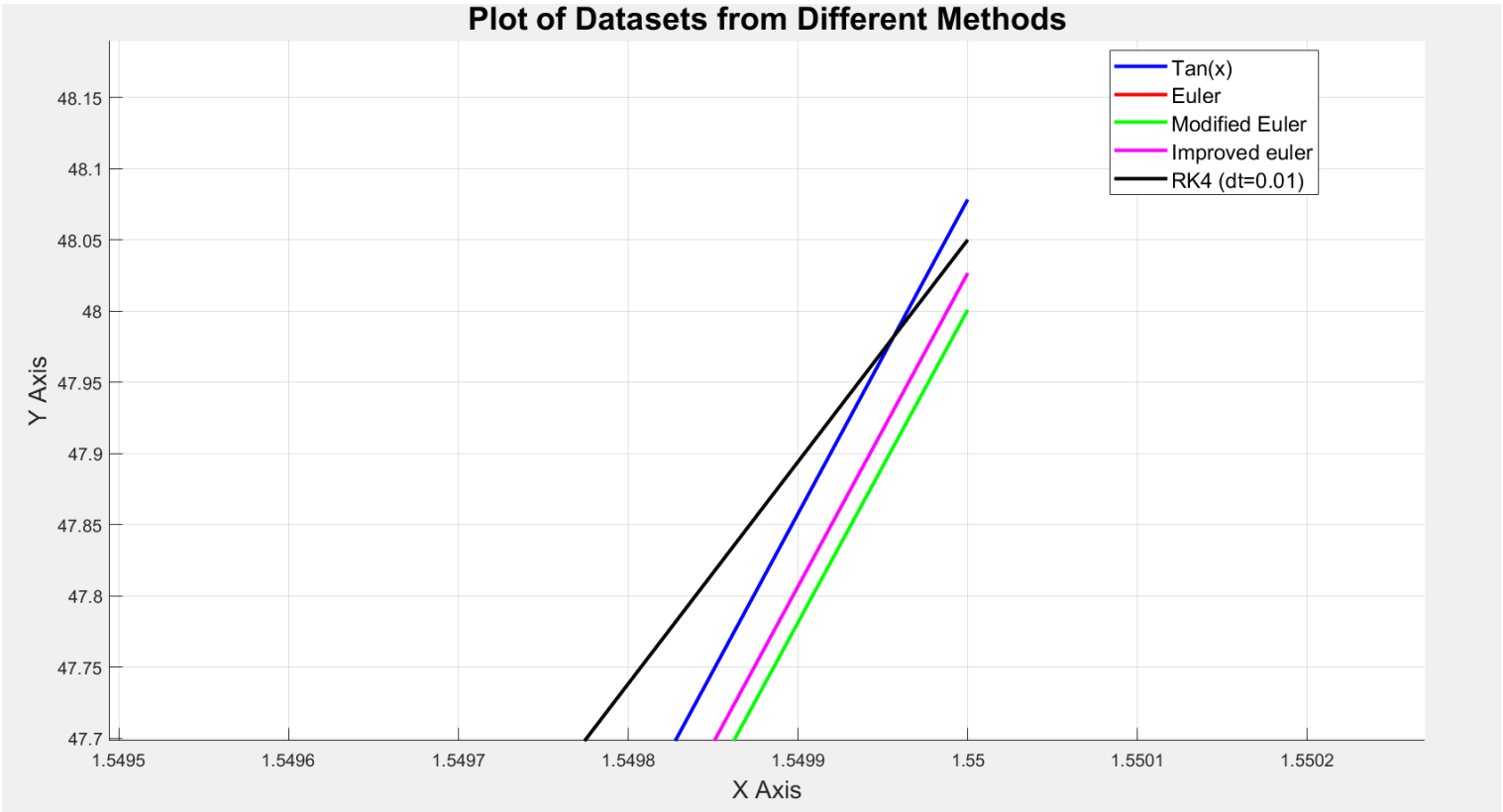
Q.3 The value of the difference yA – yIE at x=1.55 is : 5.1281320987115464E-002

Q.4 The value of the difference yA – yRK4 at x=1.55 is: 2.7853228562470633E-002

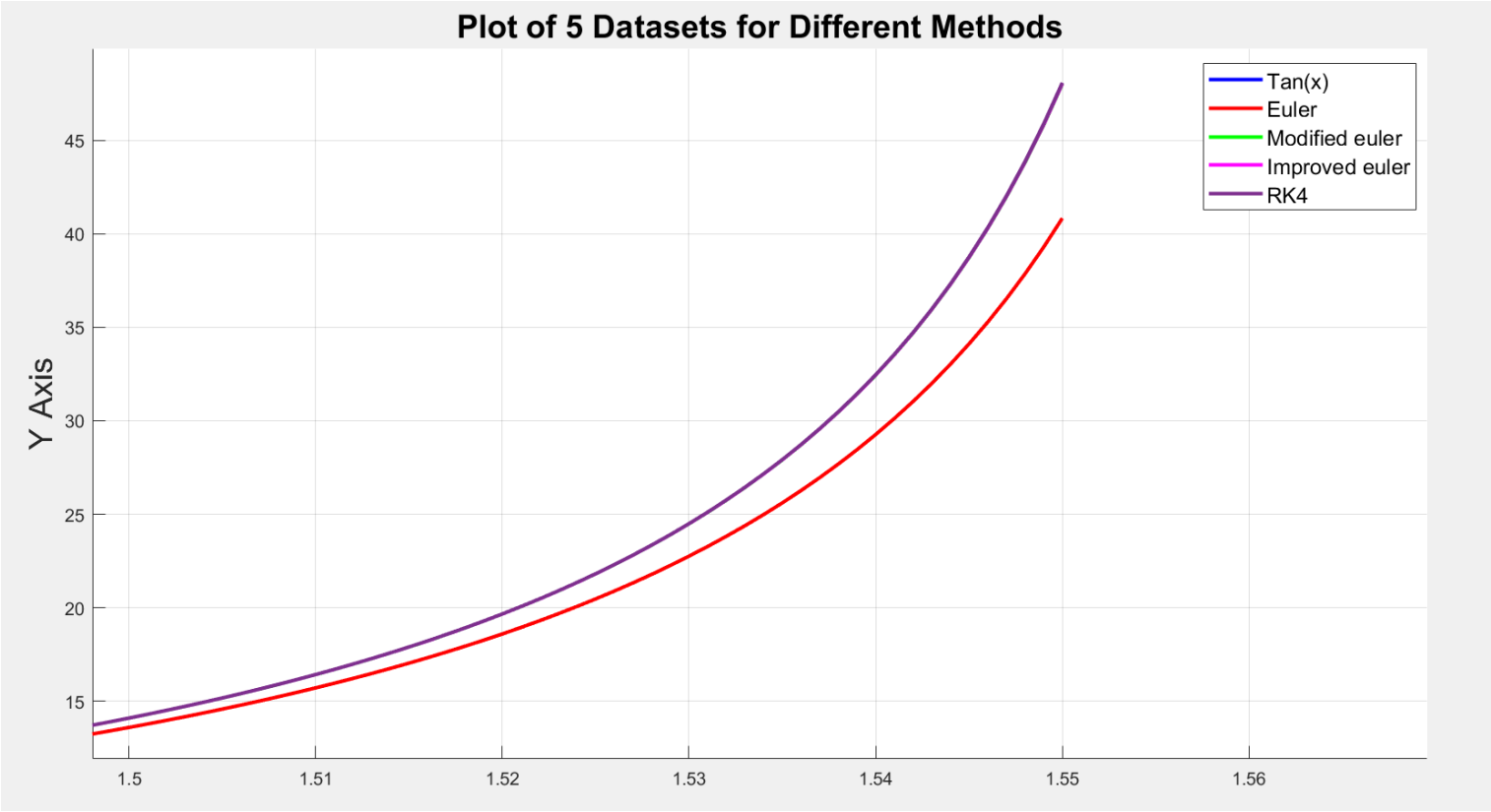
For rk4 dx=0.01

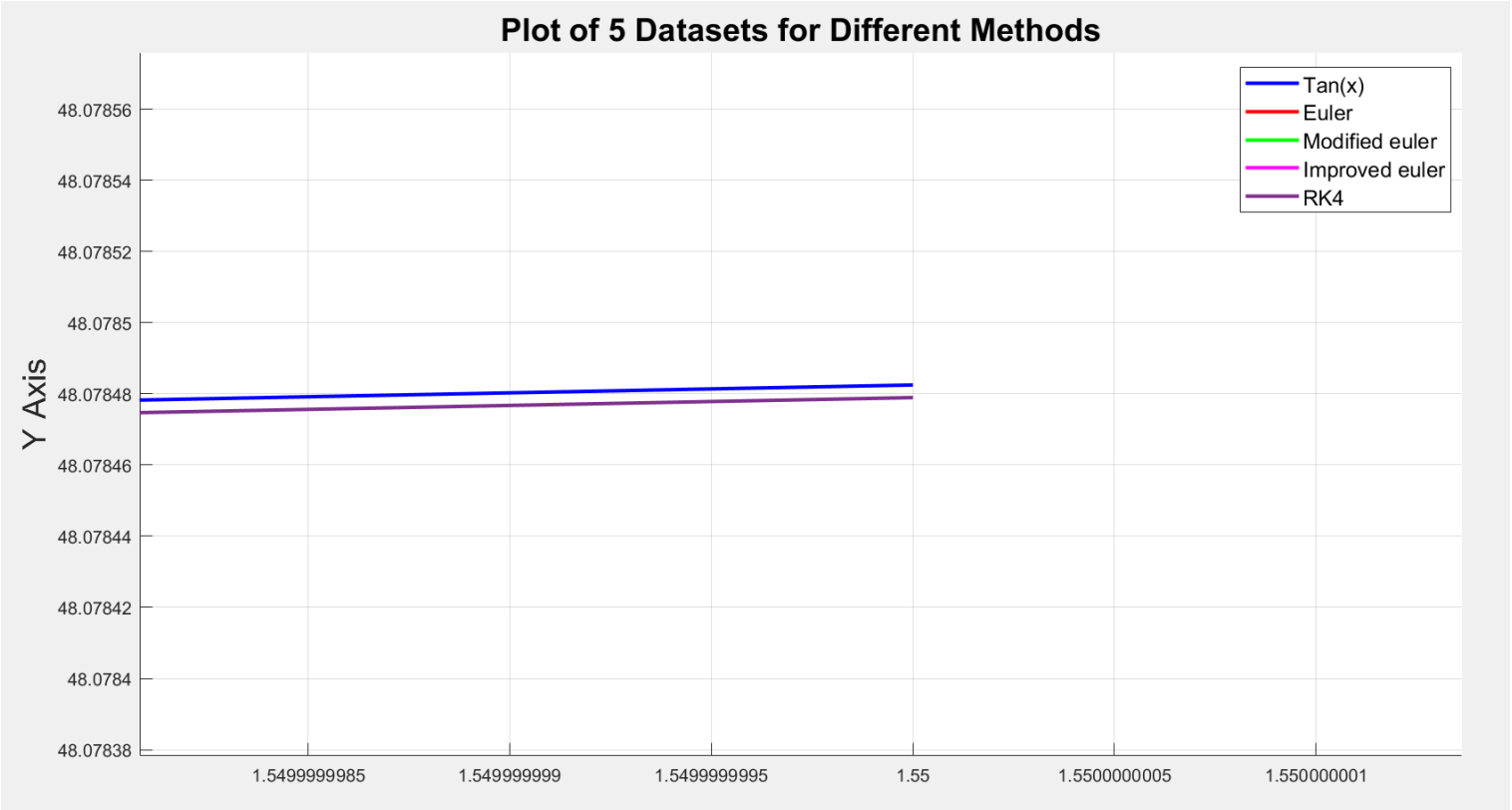



Plot of Datasets from Different Methods
Tan(x)
Euler
Modified Euler
Improved euler
RK4 (dt=0.01)
Y Axis
X Axis
50
45
40
35
30
25
20
1.5
1.51
1.52
1.53
1.54
1.55
1.56
1.57
1.58


Plot of Datasets from Different Methods
Tan(x)
Euler
Modified Euler
Improved euler
RK4 (dt=0.01)
Y Axis
X Axis
48.15
48.1
48.05
48
47.95
47.9
47.85
47.8
47.75
47.7
1.5495
1.5496
1.5497
1.5498
1.5499
1.55
1.5501
1.5502

If dx=0.001 for rk4 then





Q.5 Solve the differential equation d 2 x / dt2 = -sin(x) with initial values x0 =0.1 and v0 =1.9 at time t=0. The integration interval dt =0.01. Run the calculation for 5000 iterations, i.e. for elapsed time =50. The value of x at the end of 5000 iterations is :

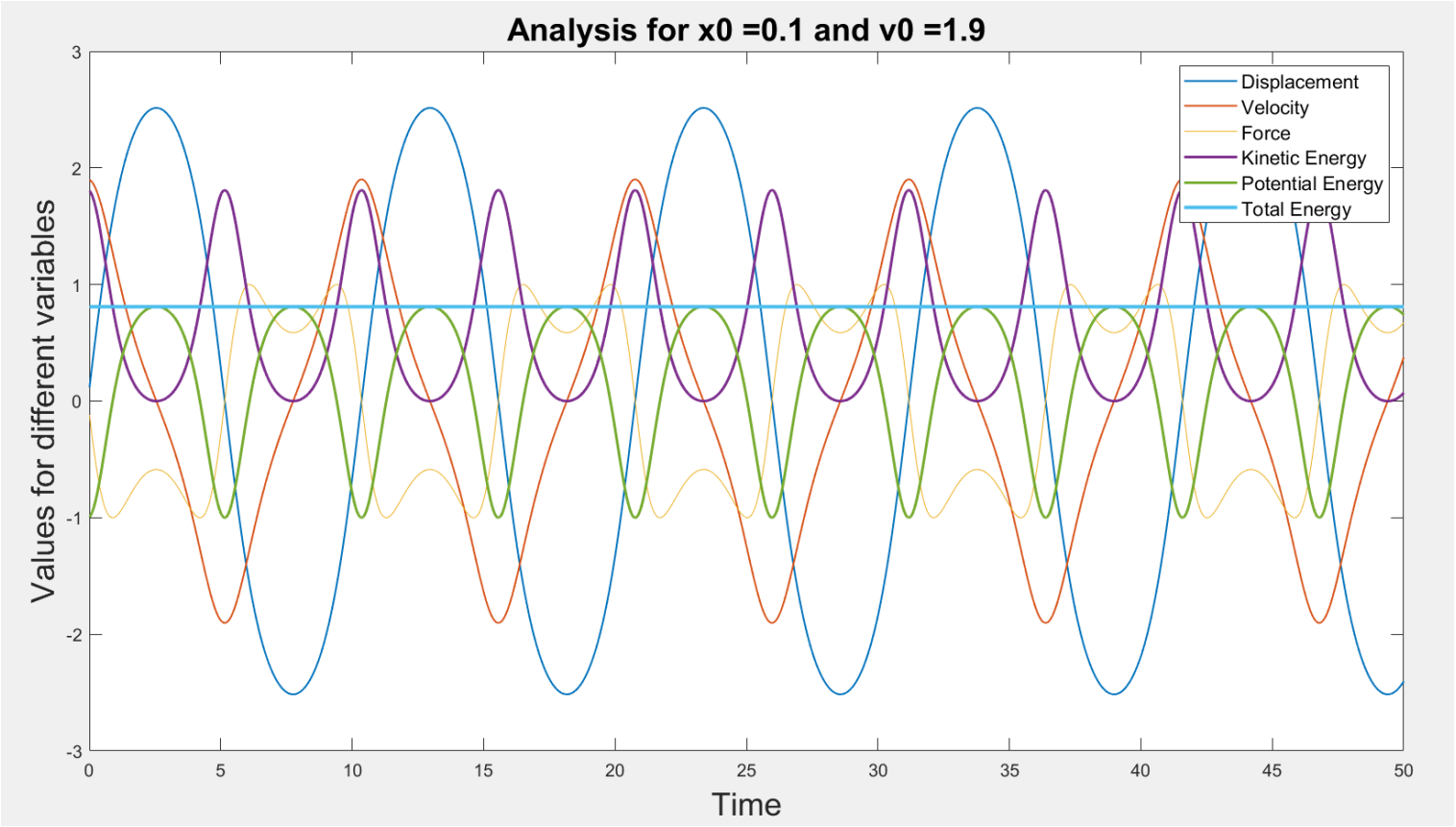
-2.4031208066180989

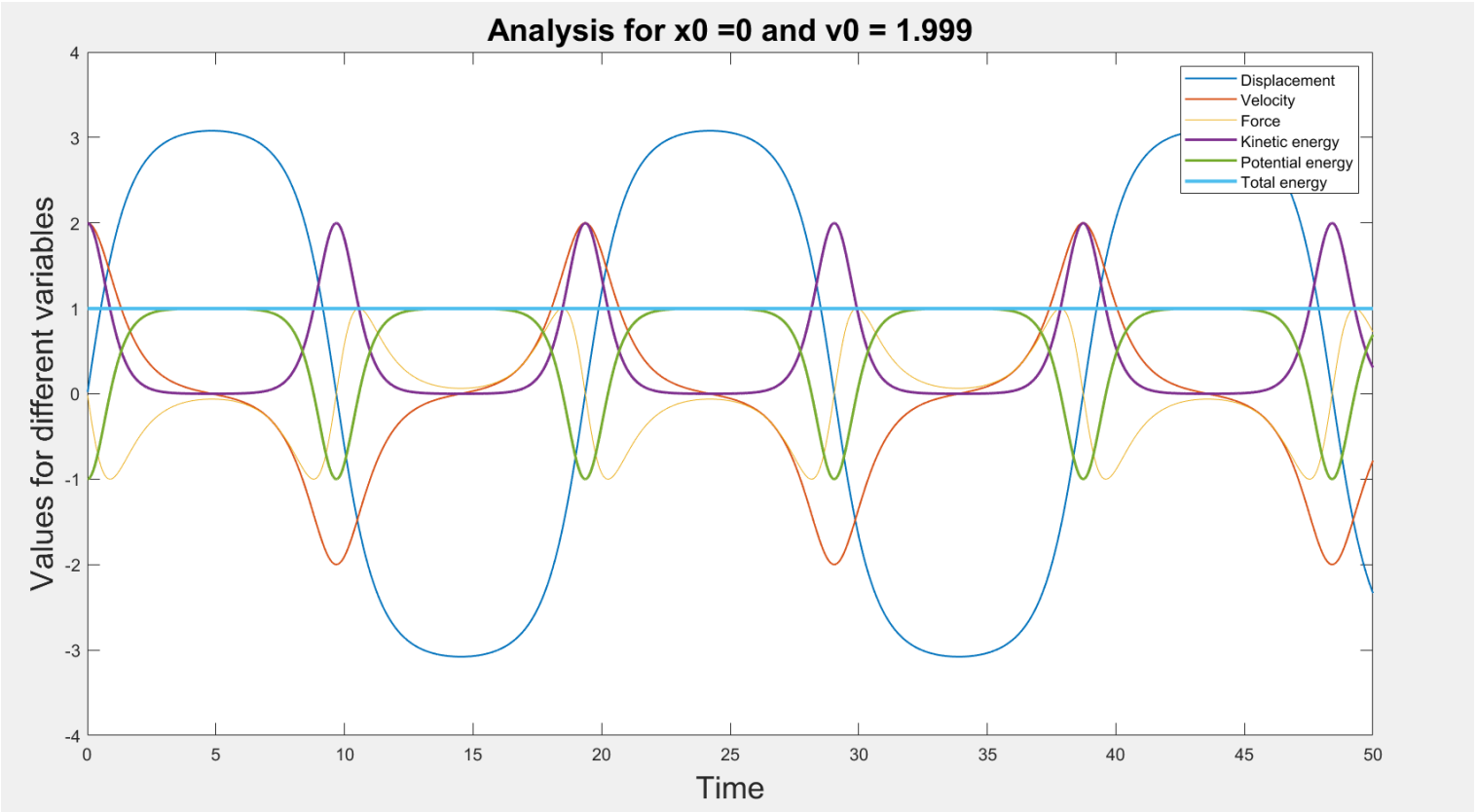
Q6. For the previous problem if the initial conditions were changed to x0 =0 and v0 = 1.999, then the value of x at the end of 5000 iterations is : -2.3334226453931675

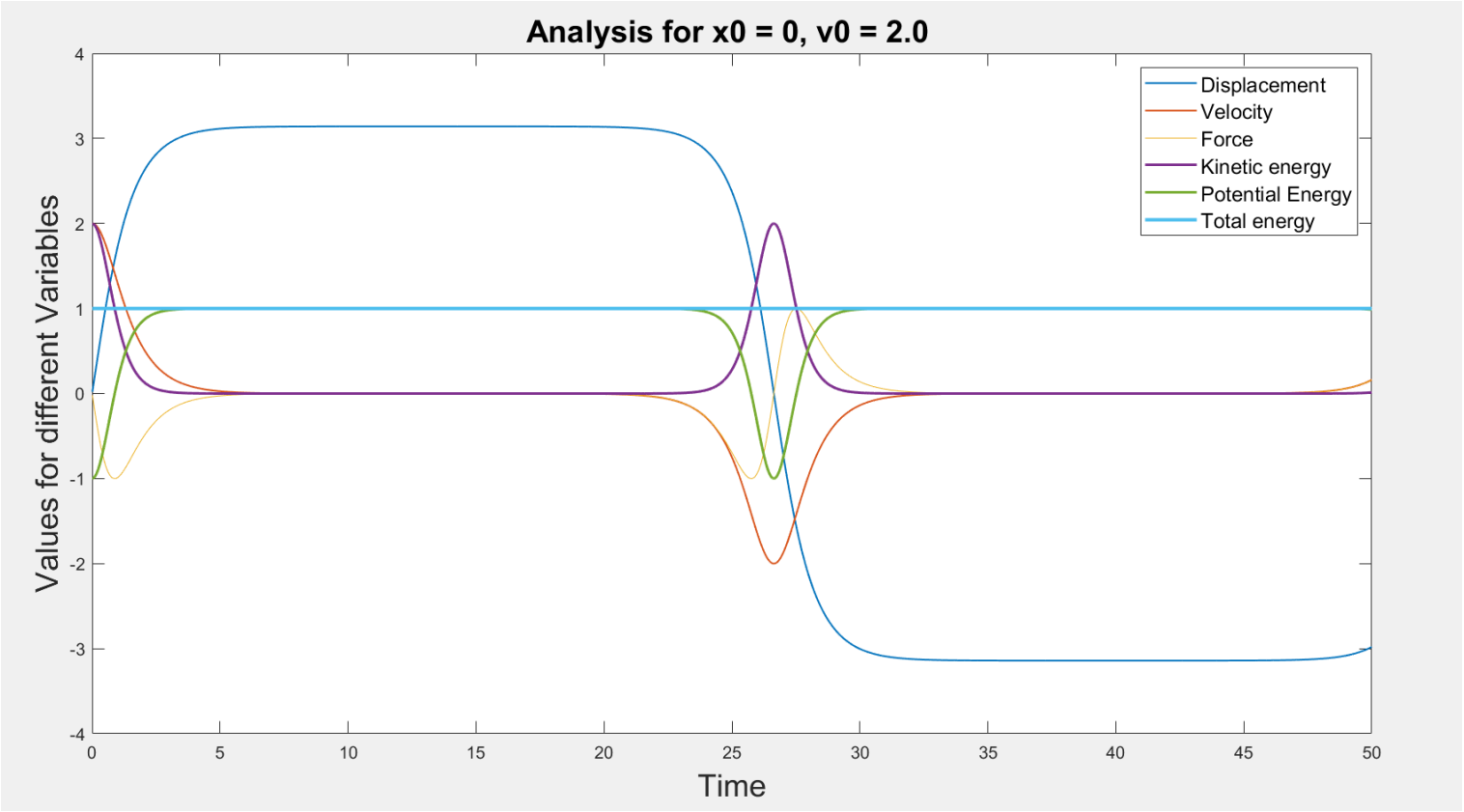
Q7. Why does the solution look so different when v_0 > 2.0d0 ?

Because the Initial velocity has value more than the critical velocity

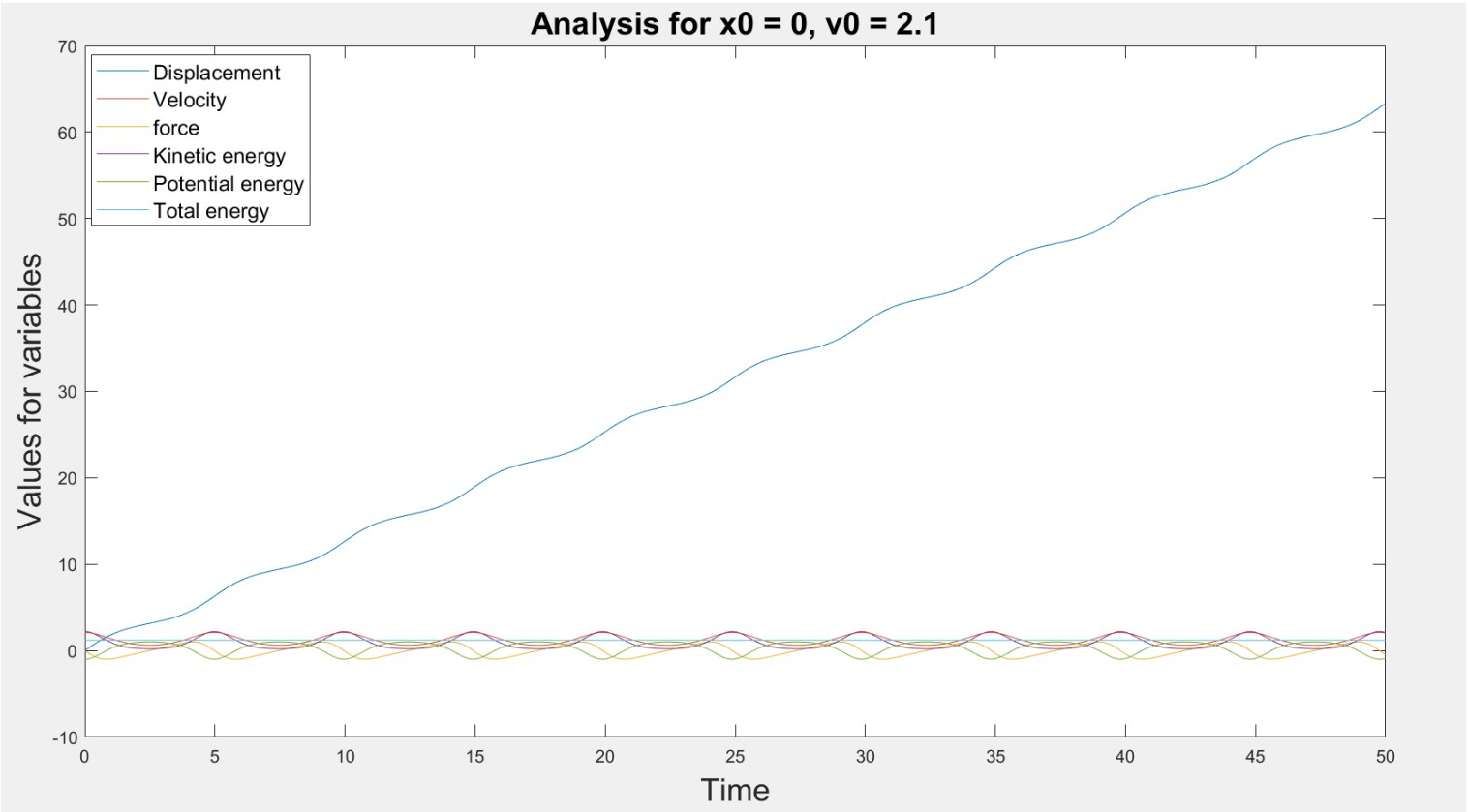
dt =0.01 for the graphs plotted below



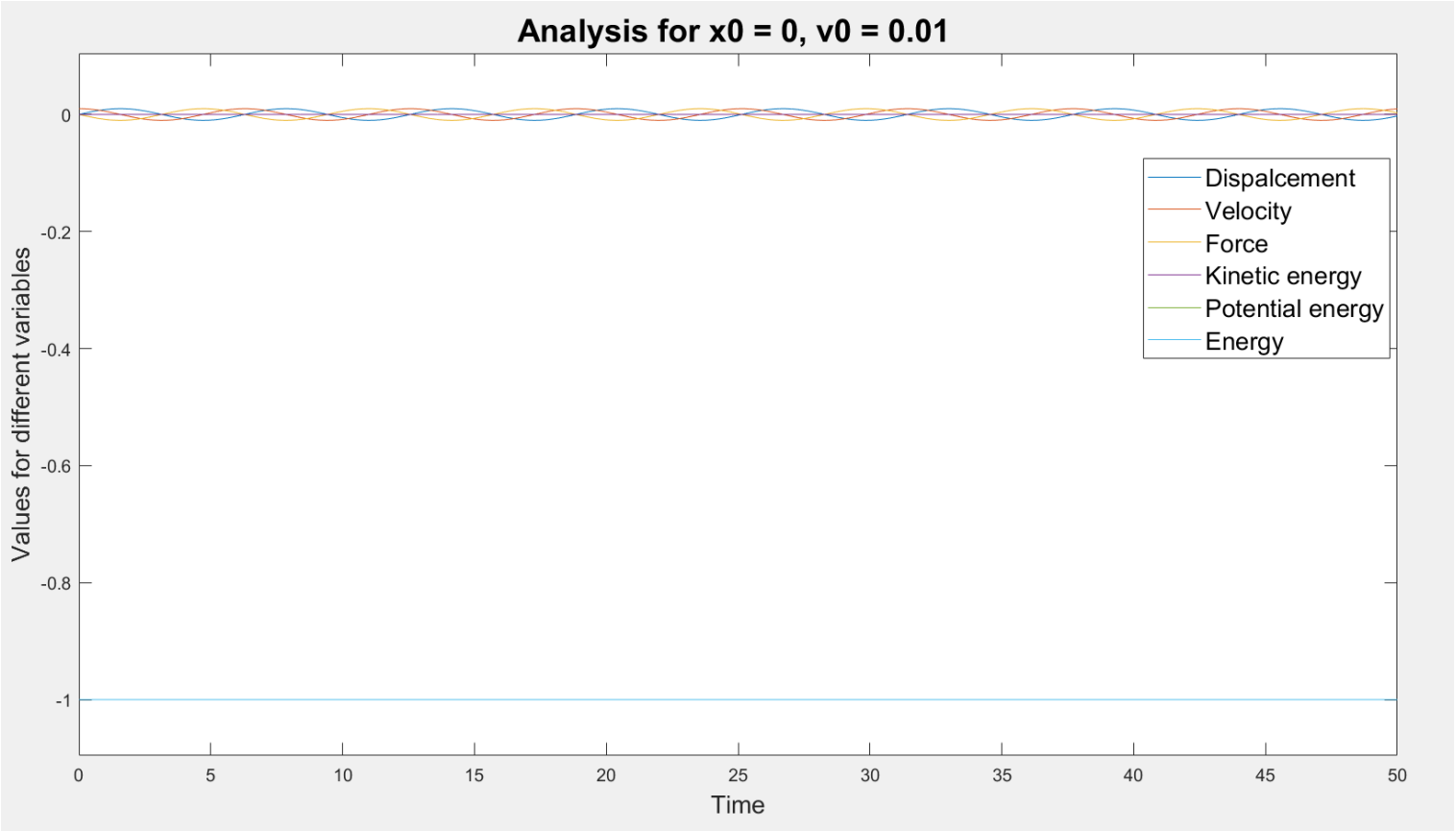


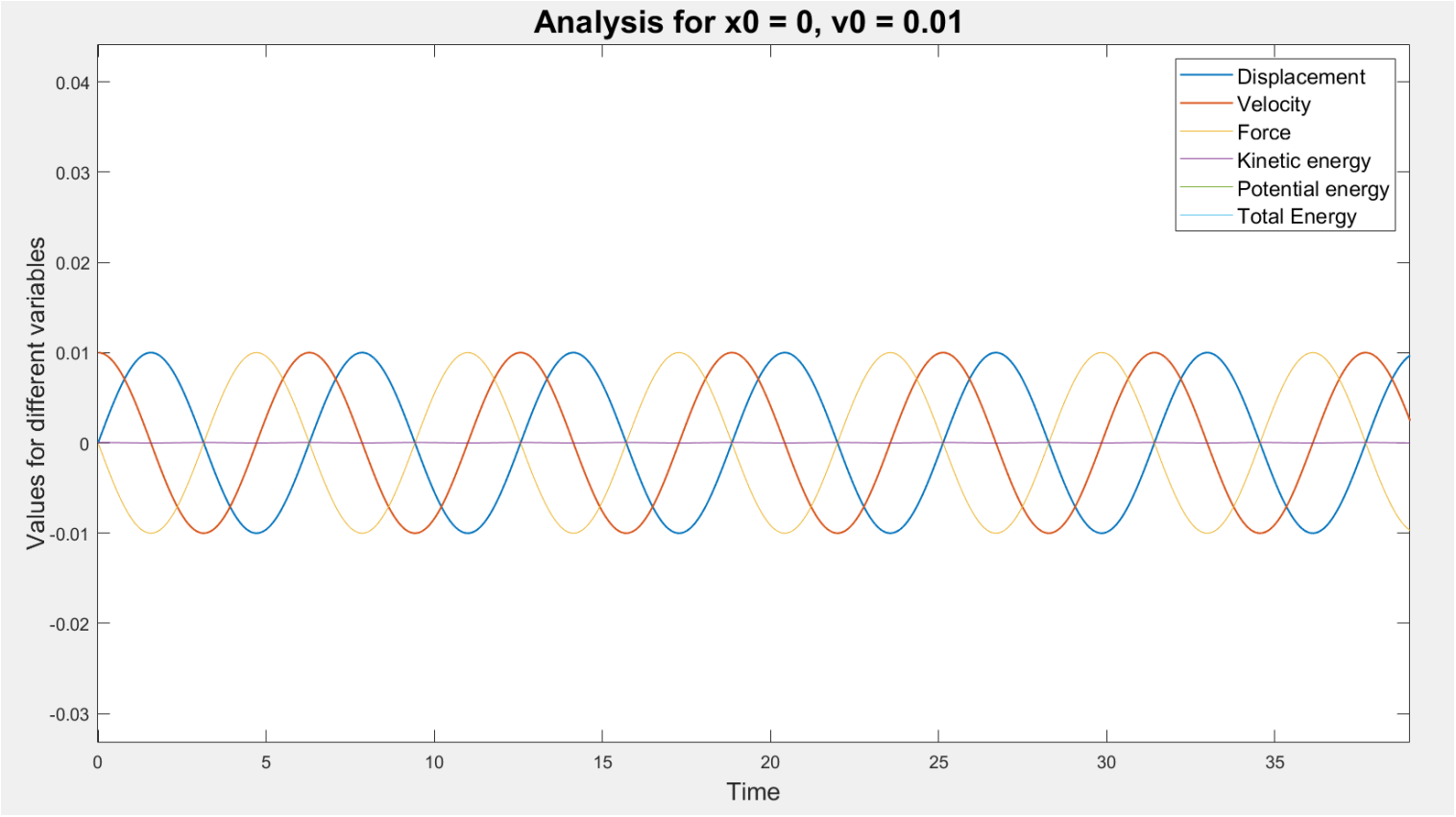


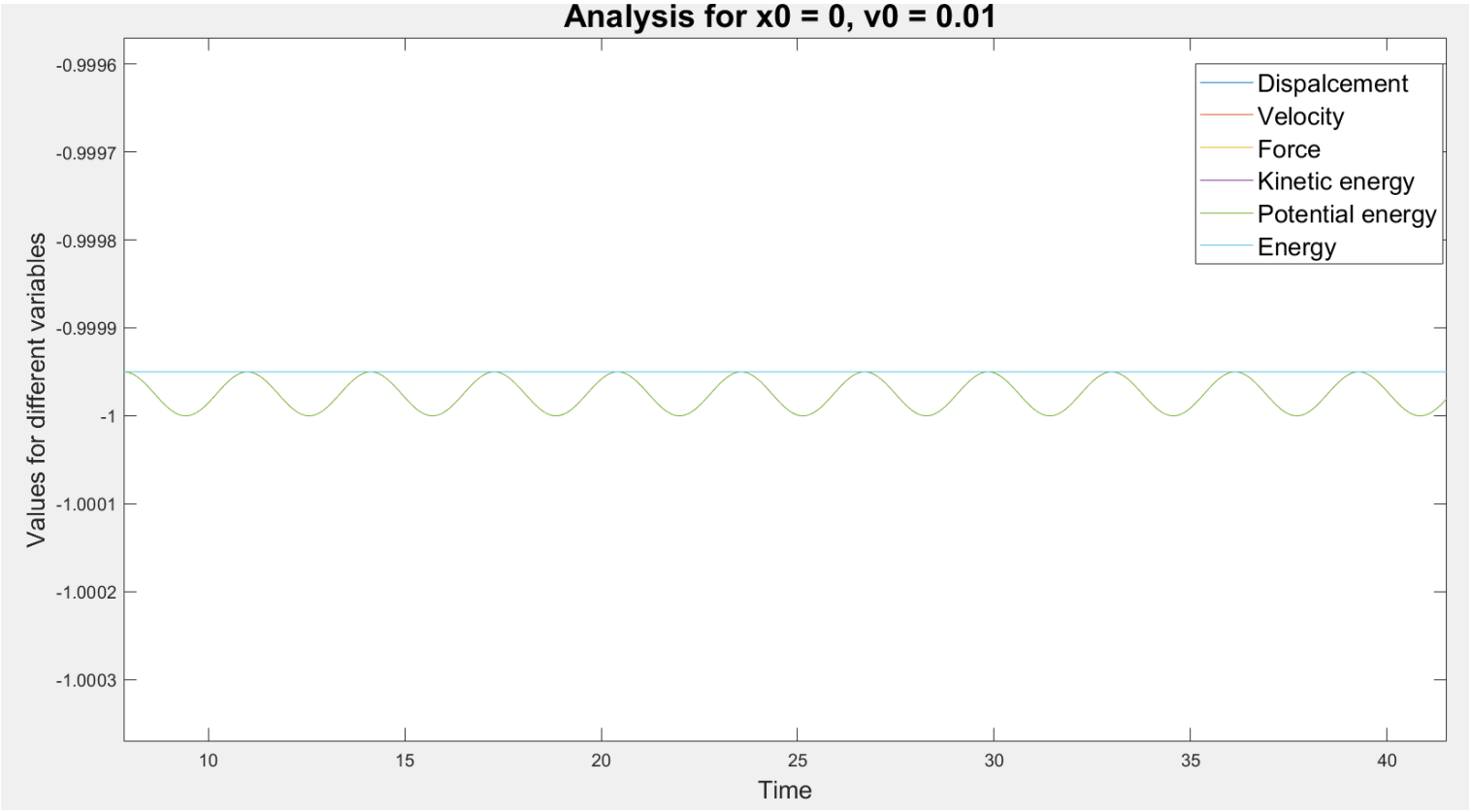
For velocity greater than 2.0



For small velocity





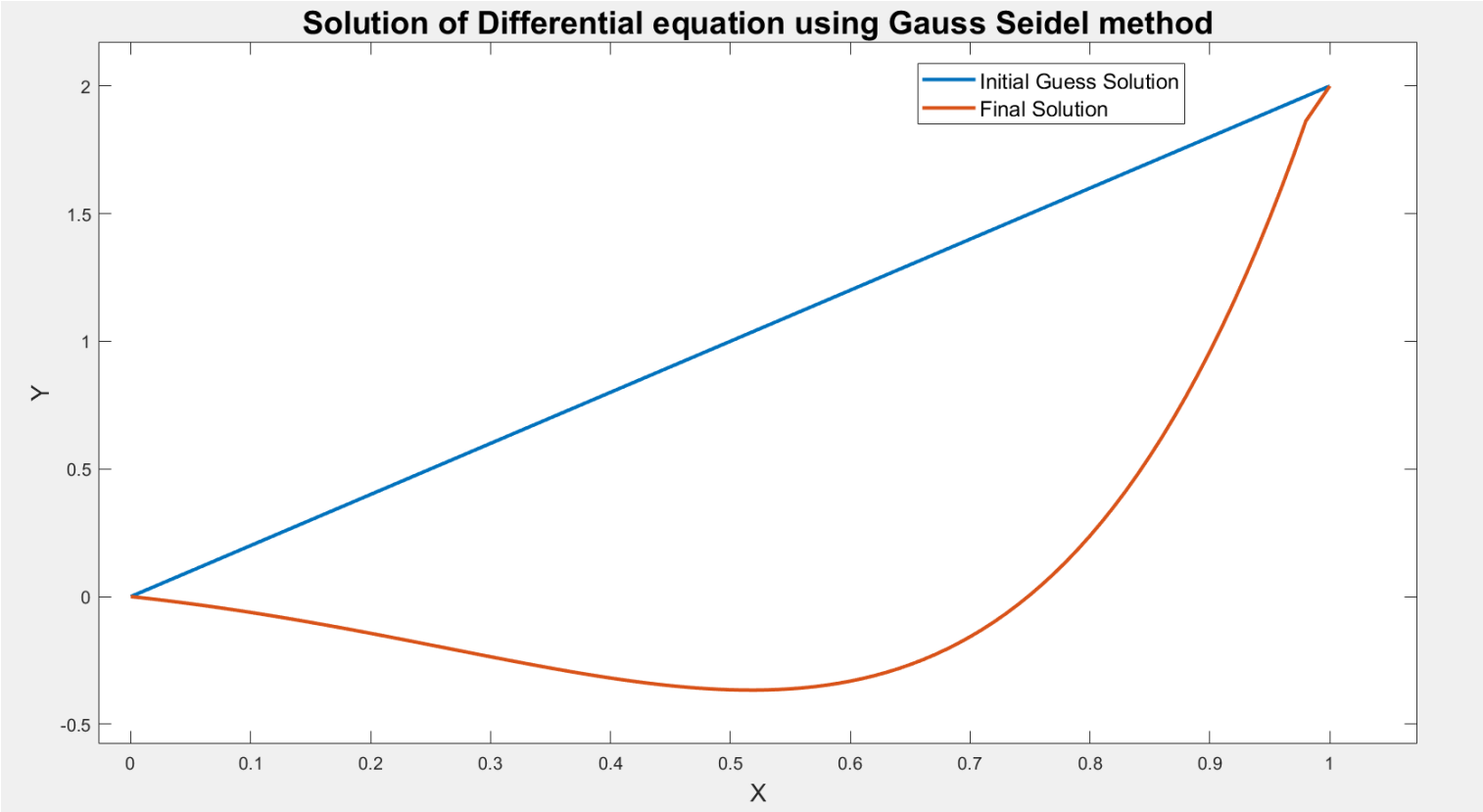


Q8

Using RK4, with dt =0.02, find yi as a function of time for all i. The position of the 1-st particle after 2000 iterations (i.e. at time t=40) is: -0.11891922333352450

Videos at desktop

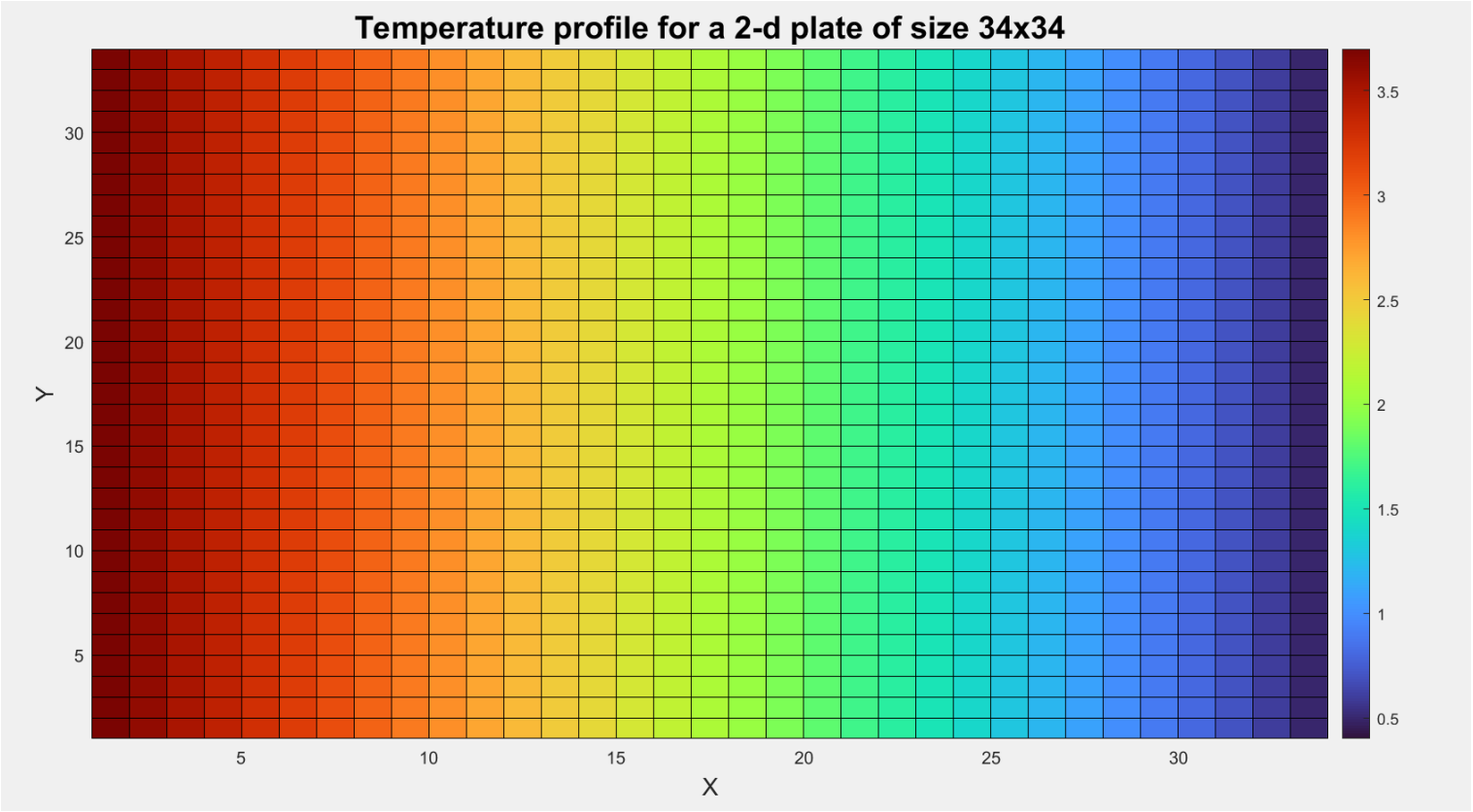
Q9. Solve the differential equation y'' - 5 y' + 10y = 10x using Gauss Seidel method and with the Boundary conditions y(x=0) =0.d0 and y (x=1.0) = 2.0d0 with dx =0.01 and convergence condition as 0.0001. The boundary condition y (x=1.0) = 2.0d0 implies the value of y =2.0.0d0 at x=1.0. The value of y at x=0.80 is : 0.23805459238610624

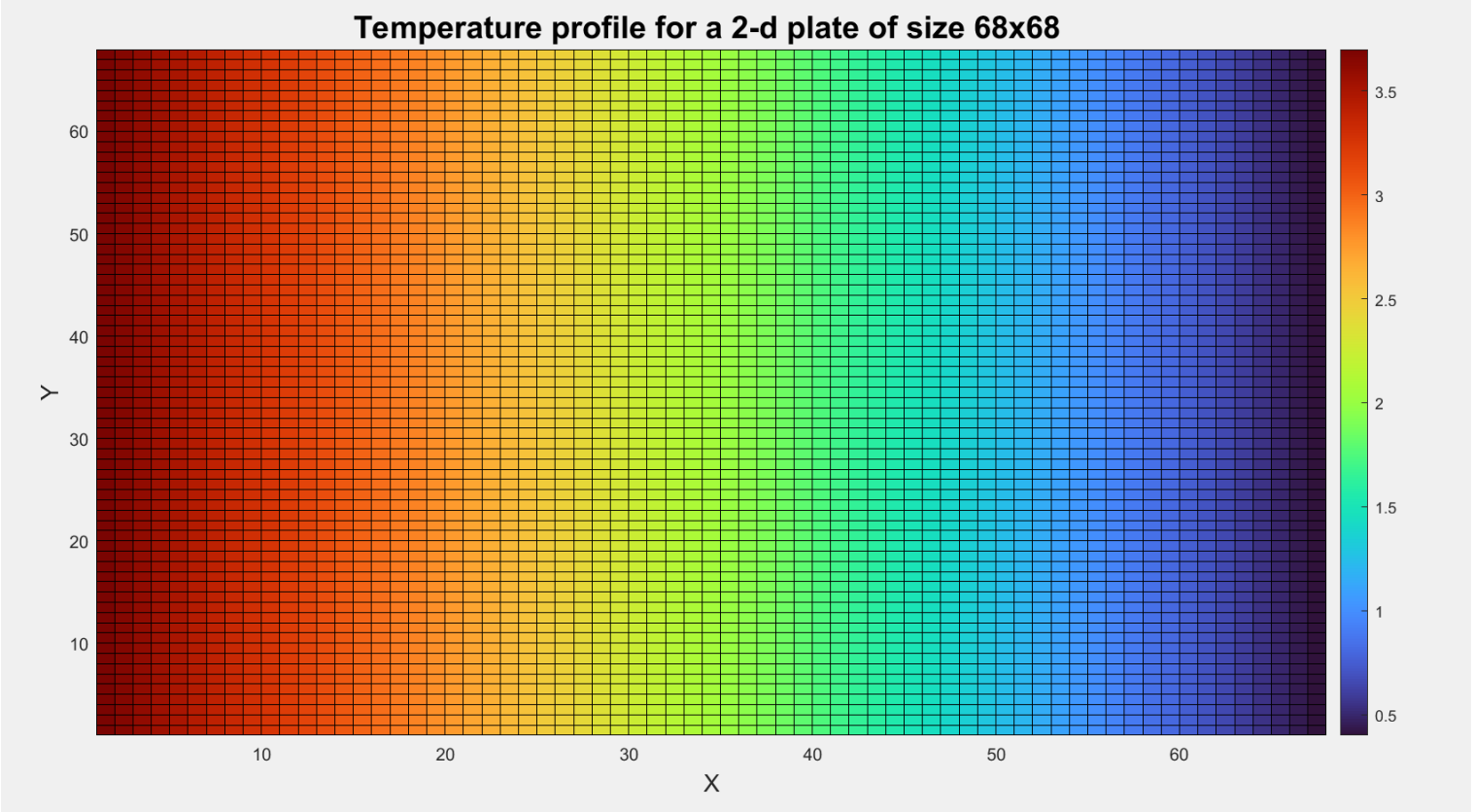


PDE

Q3 Laplace’s

The temperature at point (20,20) for 34*34 size is : 1.7791982400306050

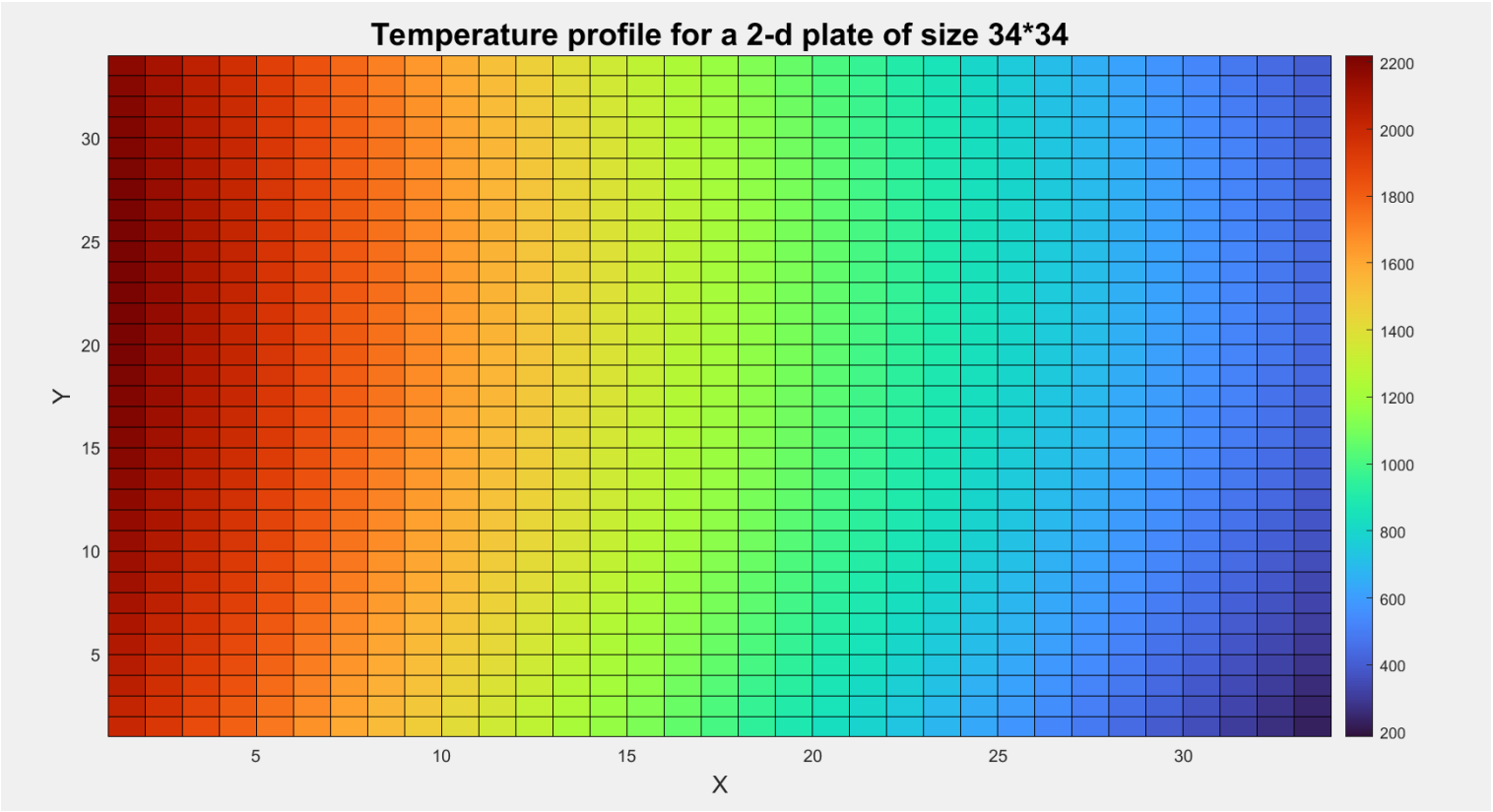


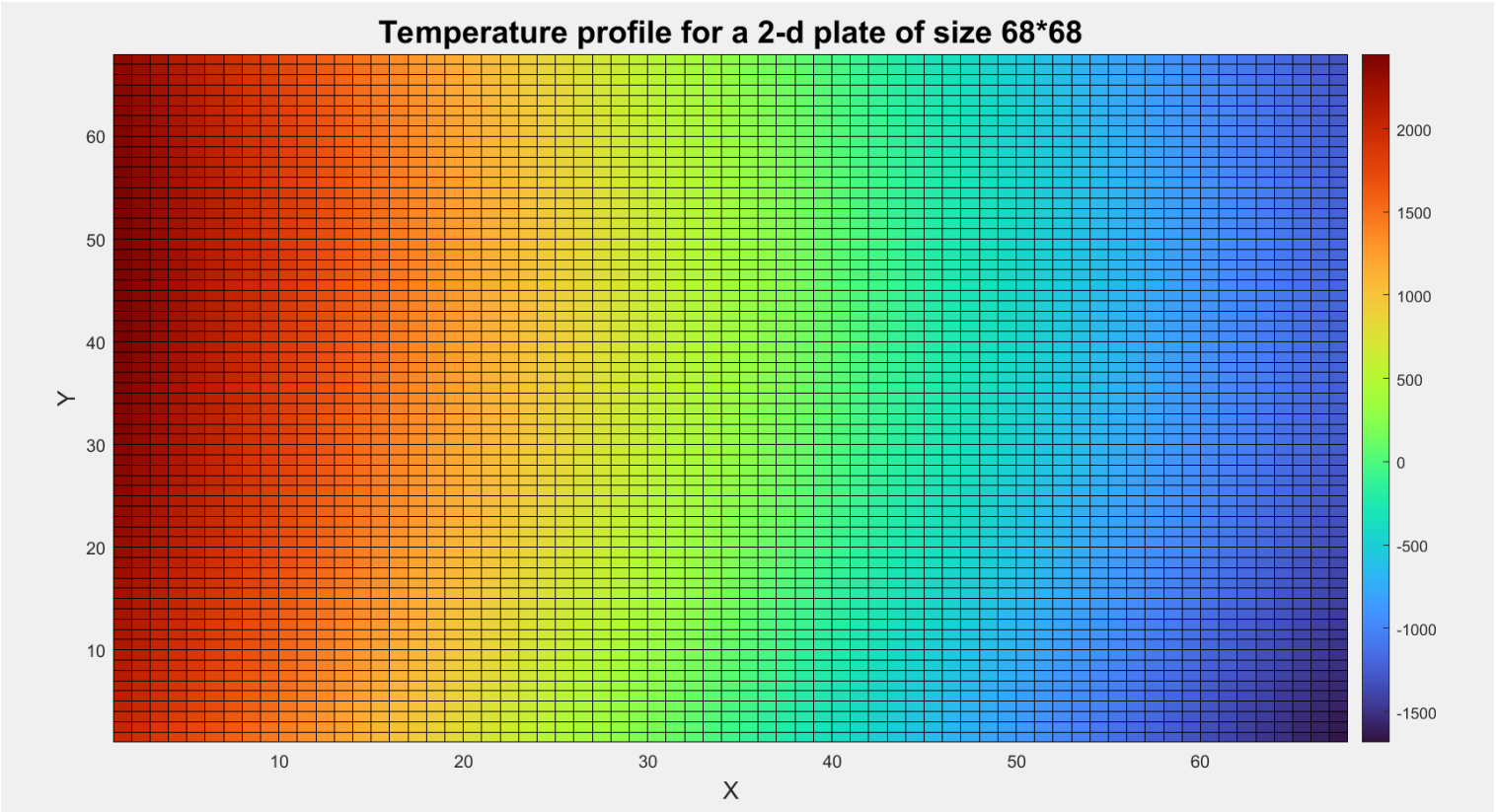


For 68*68 size Temperature at 40,40 = 1.6809896049308175

Q4 Neumann’s

What is the temperature at (10,10) for 34*34 sized plate : 1550.0012733039932





For 68*68 the temperature at 20,20 is 1050.0056324931923