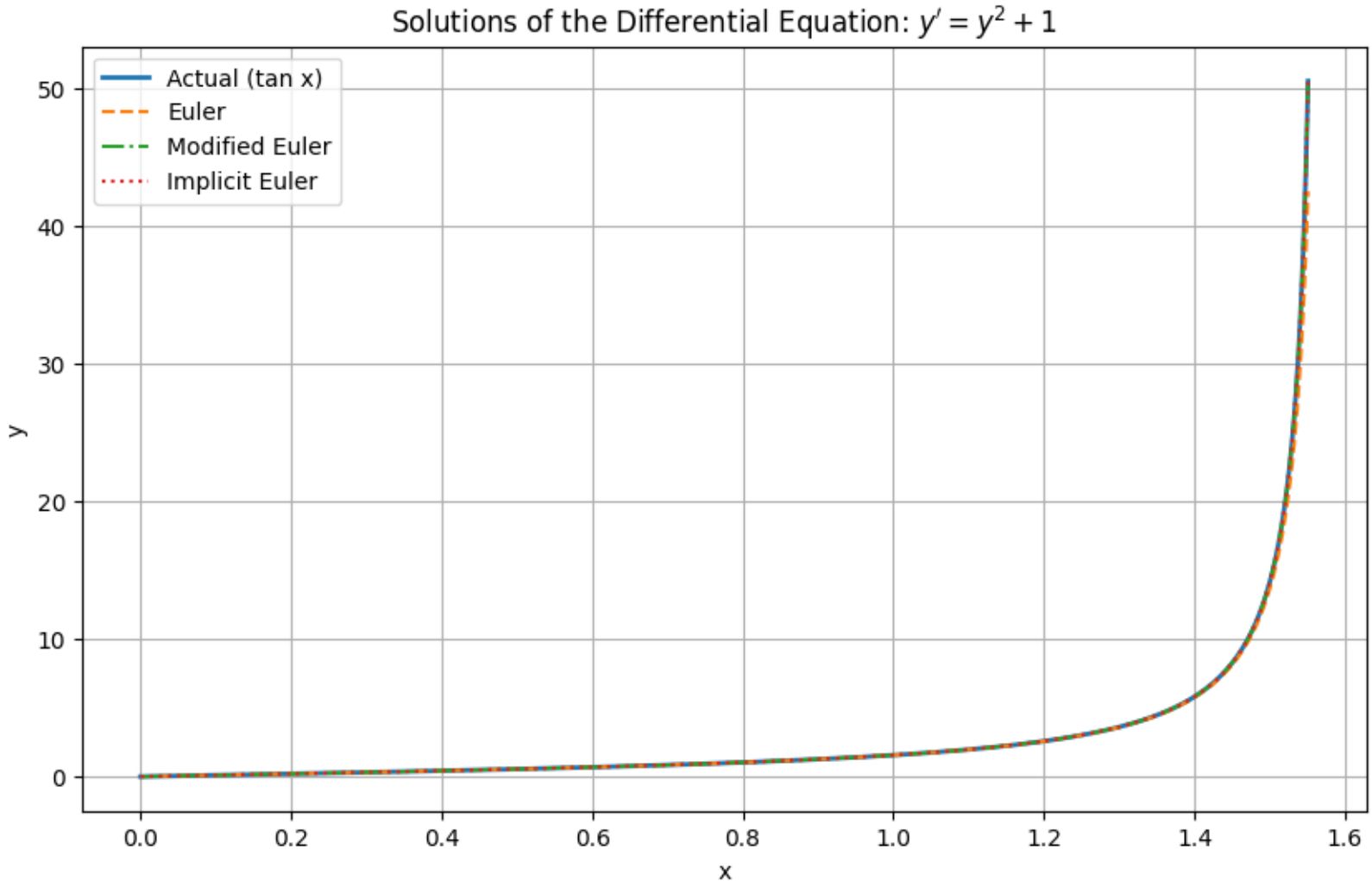
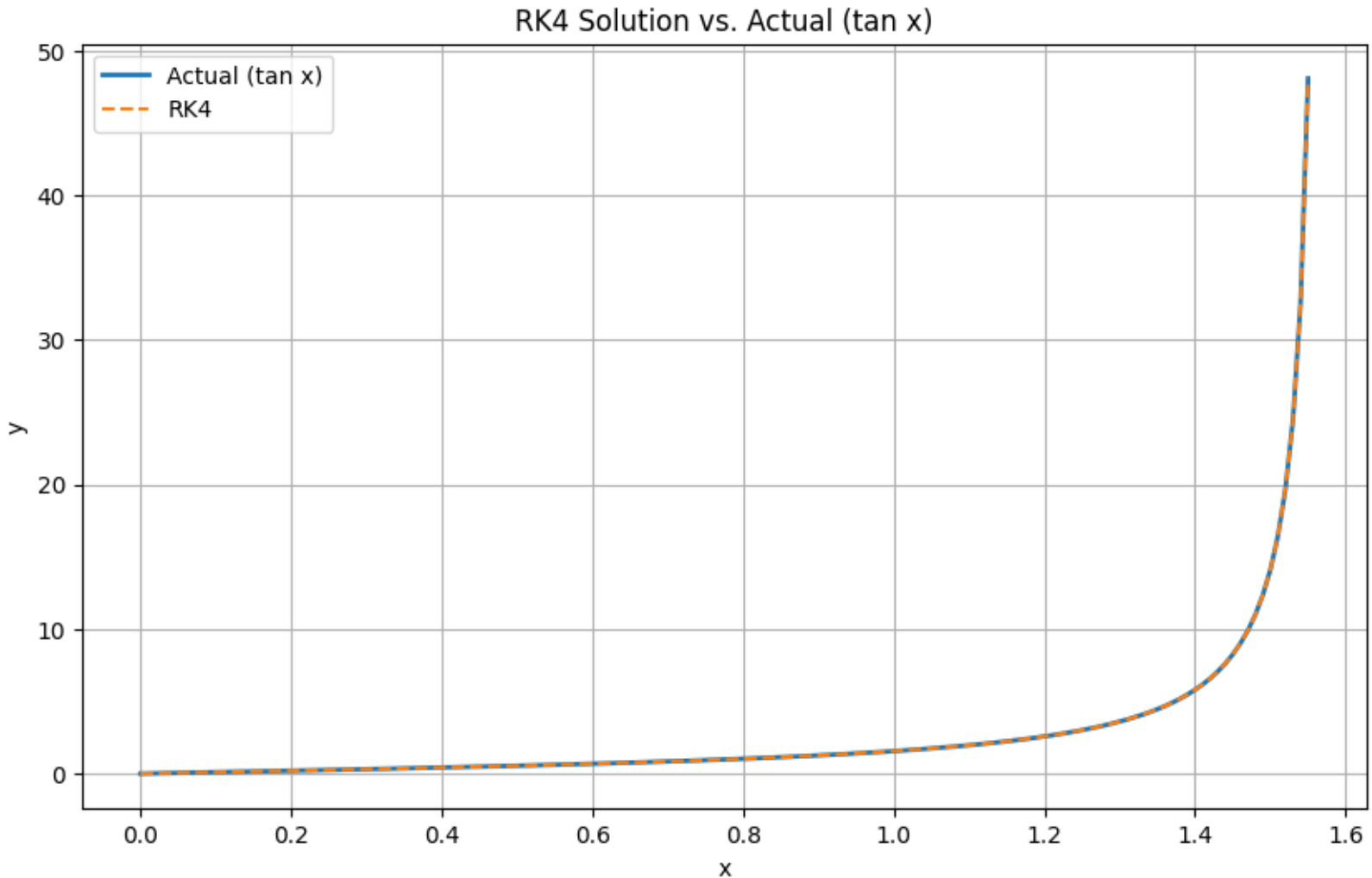
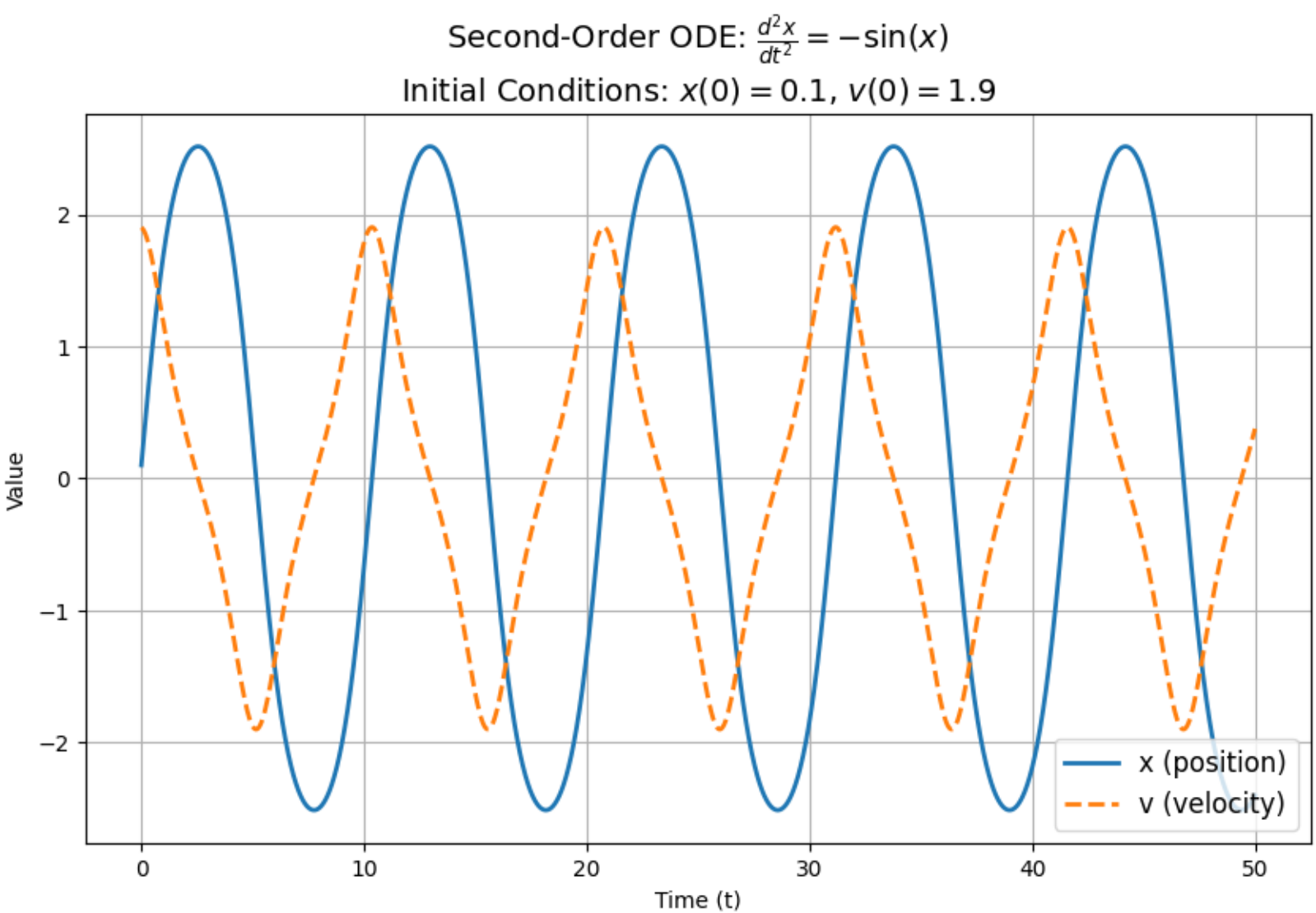
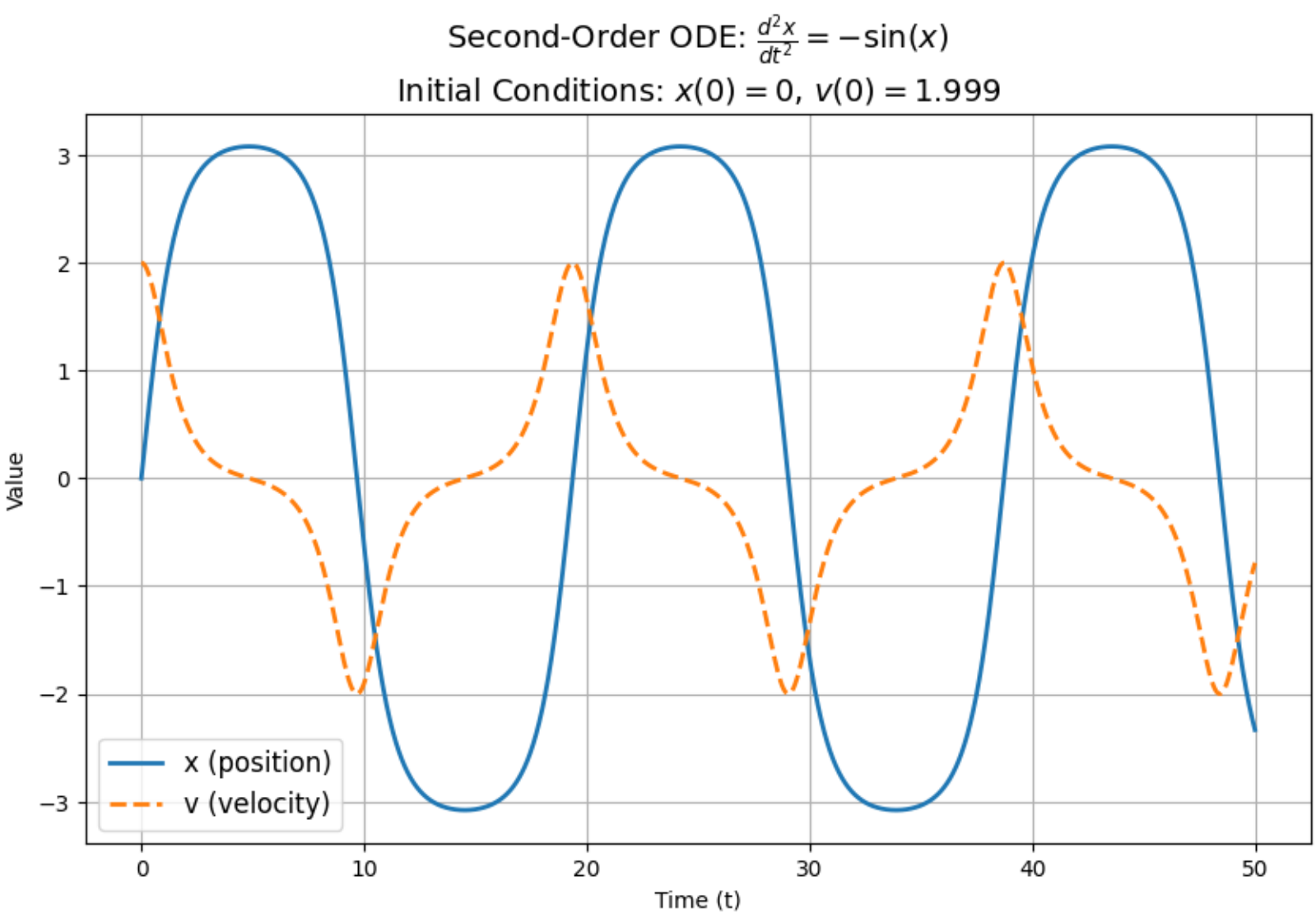
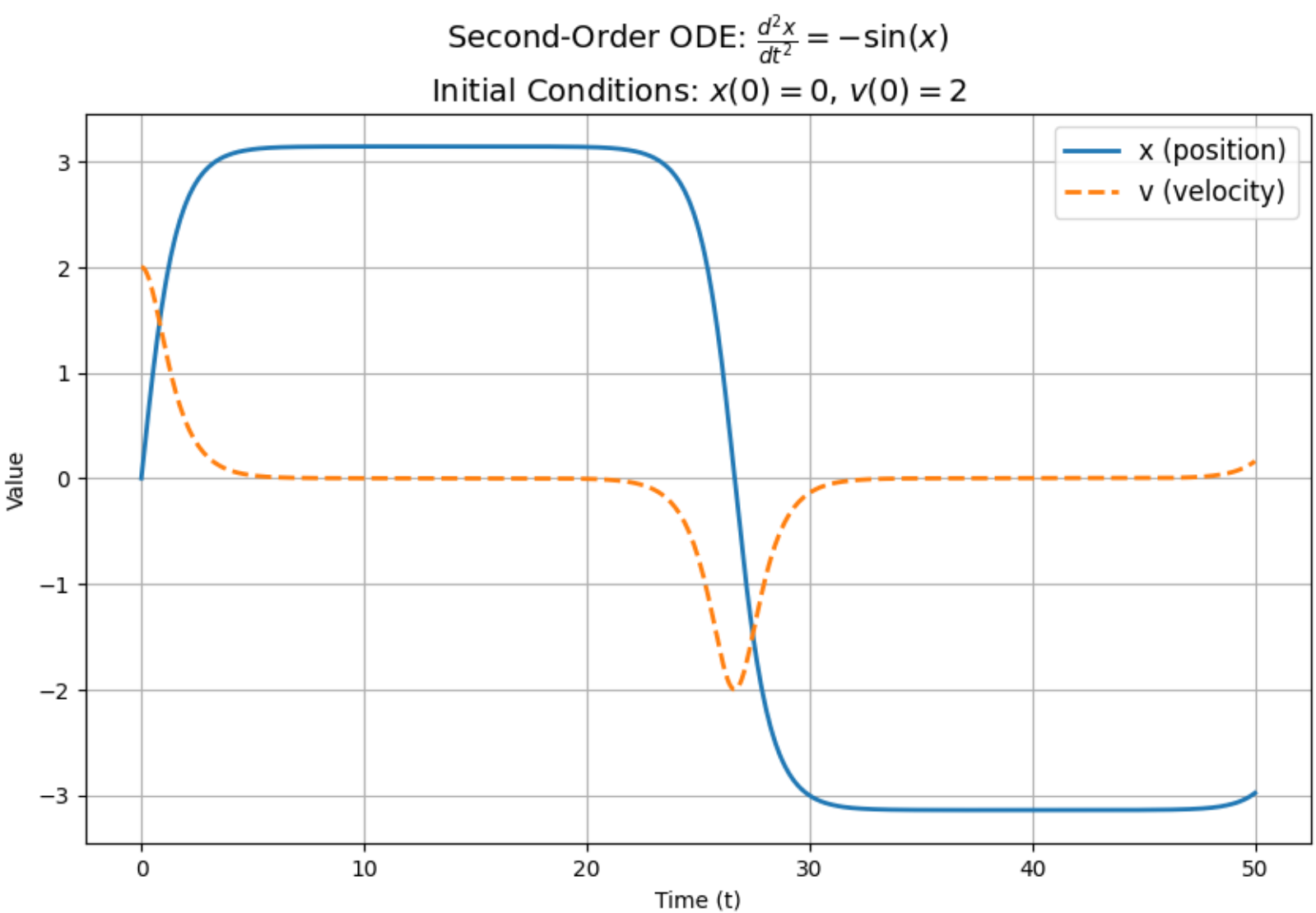
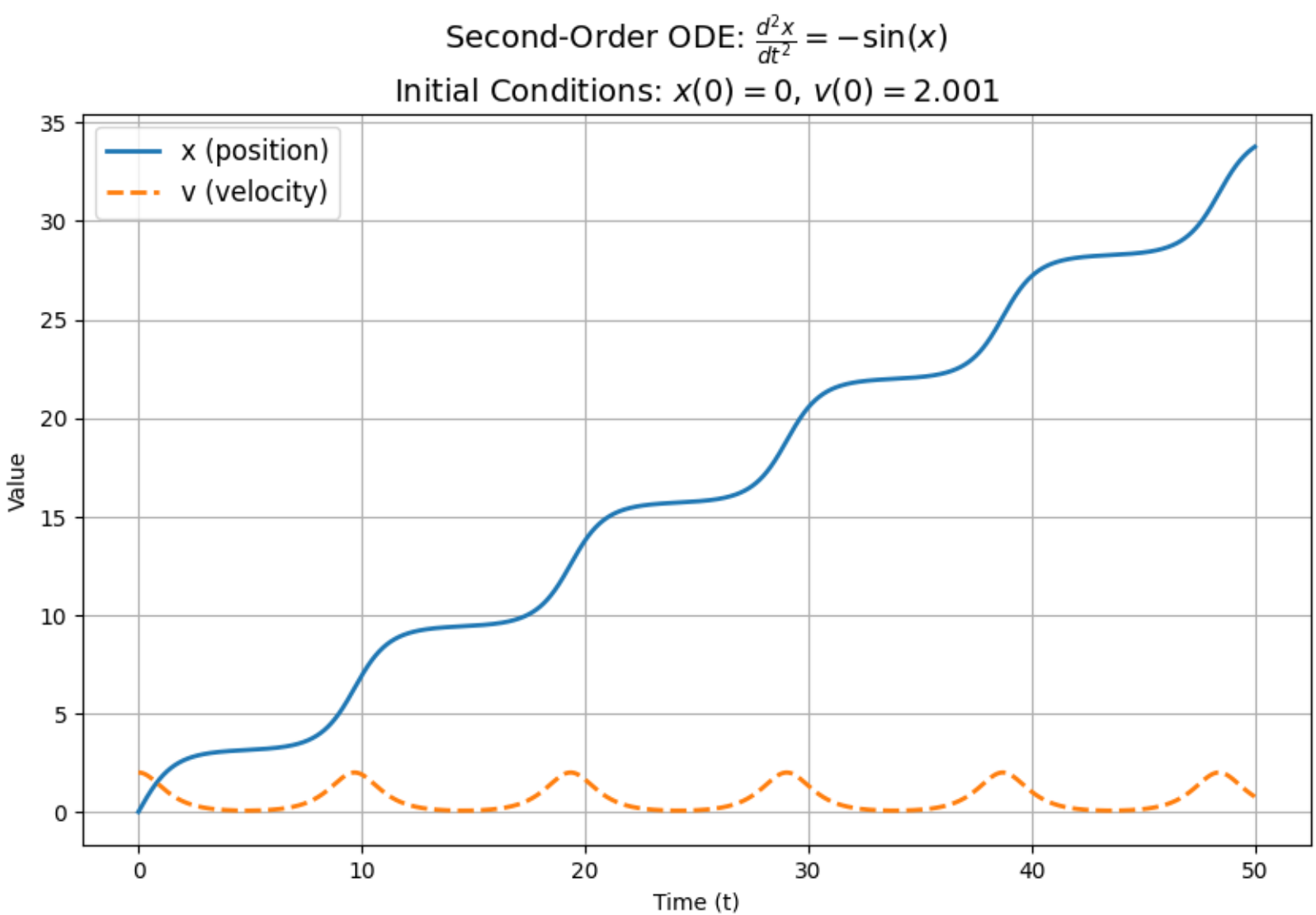

Solutions of the Differential Equation: $y' = y^2 + 1$
Actual (tan x)
Euler
Modified Euler
Implicit Euler
y
x
0
10
20
30
40
50
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6

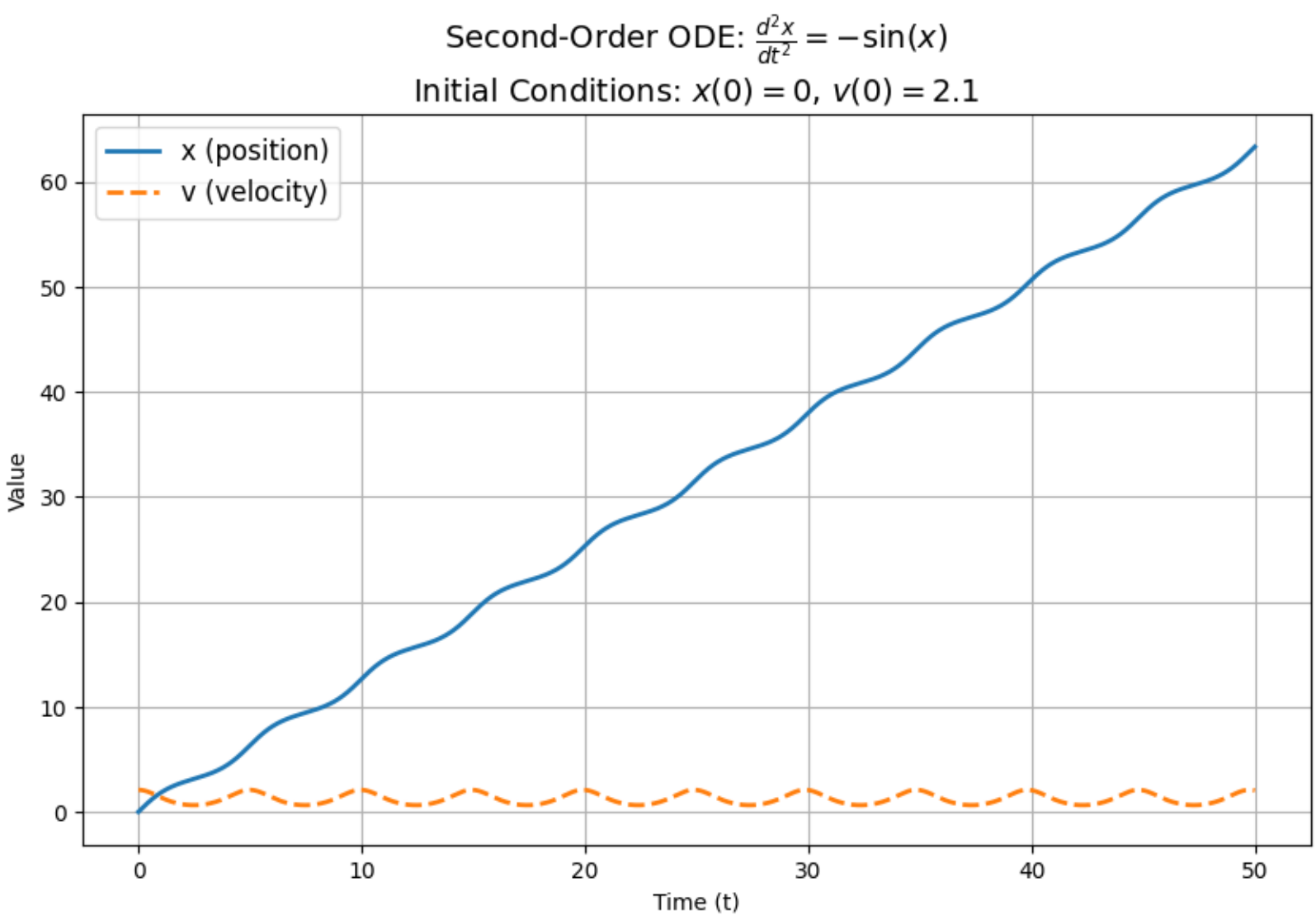

RK4 Solution vs. Actual (tan x)
Actual (tan x)
RK4
y
x
0
10
20
30
40
50
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6

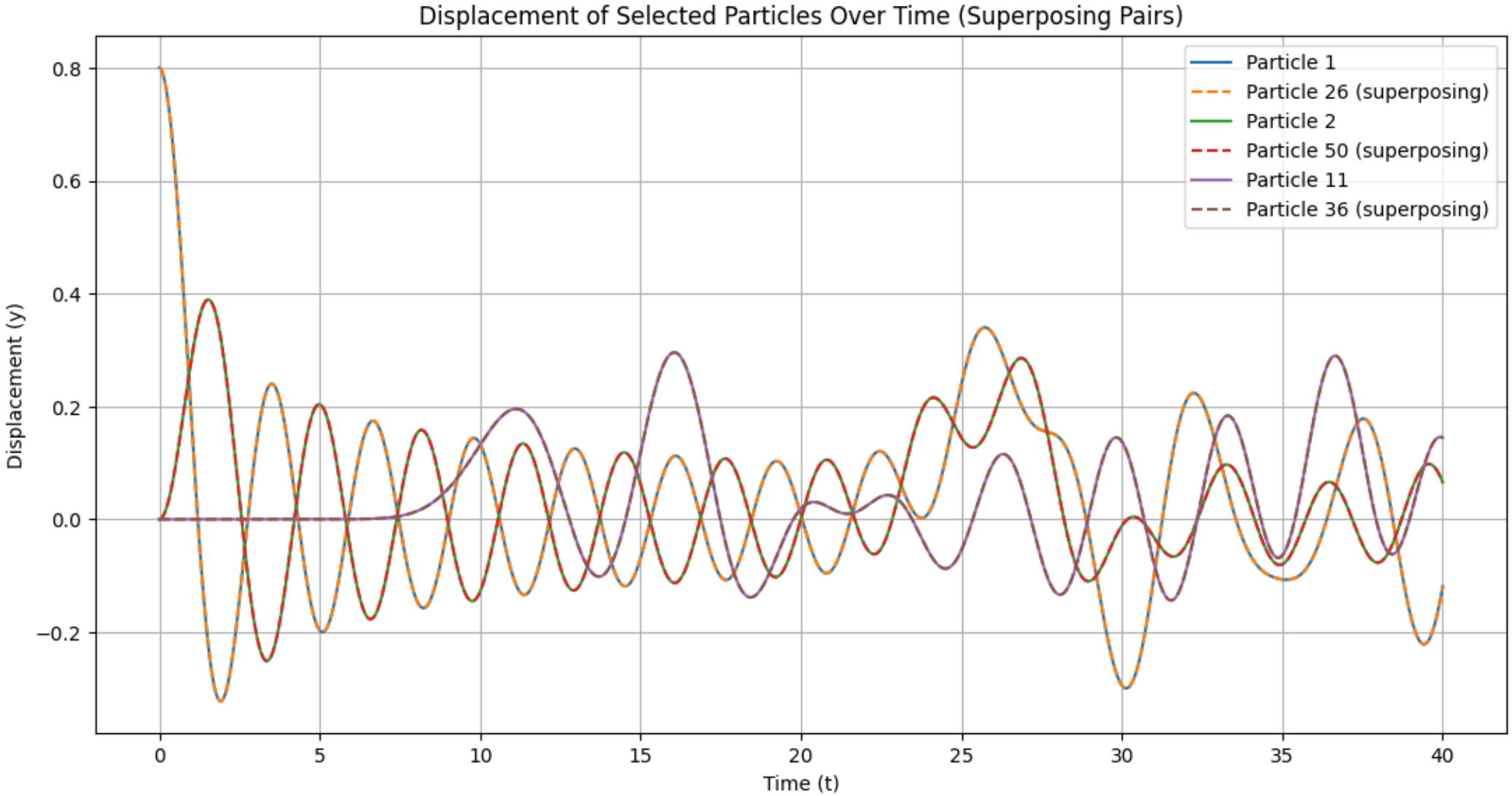

Second-Order ODE: $\frac{d^2x}{dt^2} = -\sin(x)$
Initial Conditions: $x(0) = 0.1$, $v(0) = 1.9$
Value
Time (t)
x (position)
v (velocity)
2
1
0
−1
−2
0
10
20
30
40
50

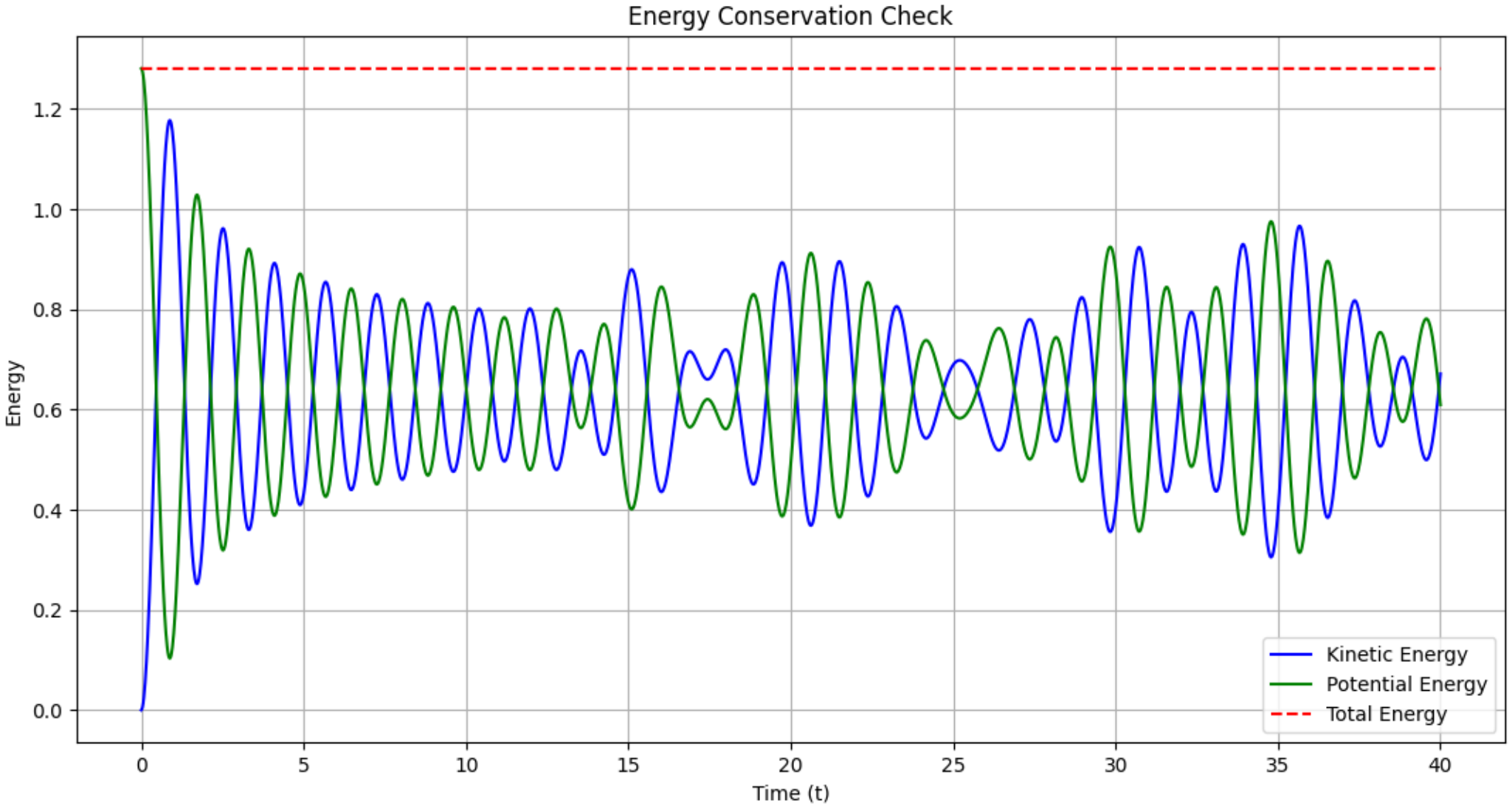

Second-Order ODE: $\frac{d^2x}{dt^2} = -\sin(x)$
Initial Conditions: $x(0) = 0$, $v(0) = 1.999$
Value
Time (t)
x (position)
v (velocity)
3
2
1
0
−1
−2
−3
0
10
20
30
40
50

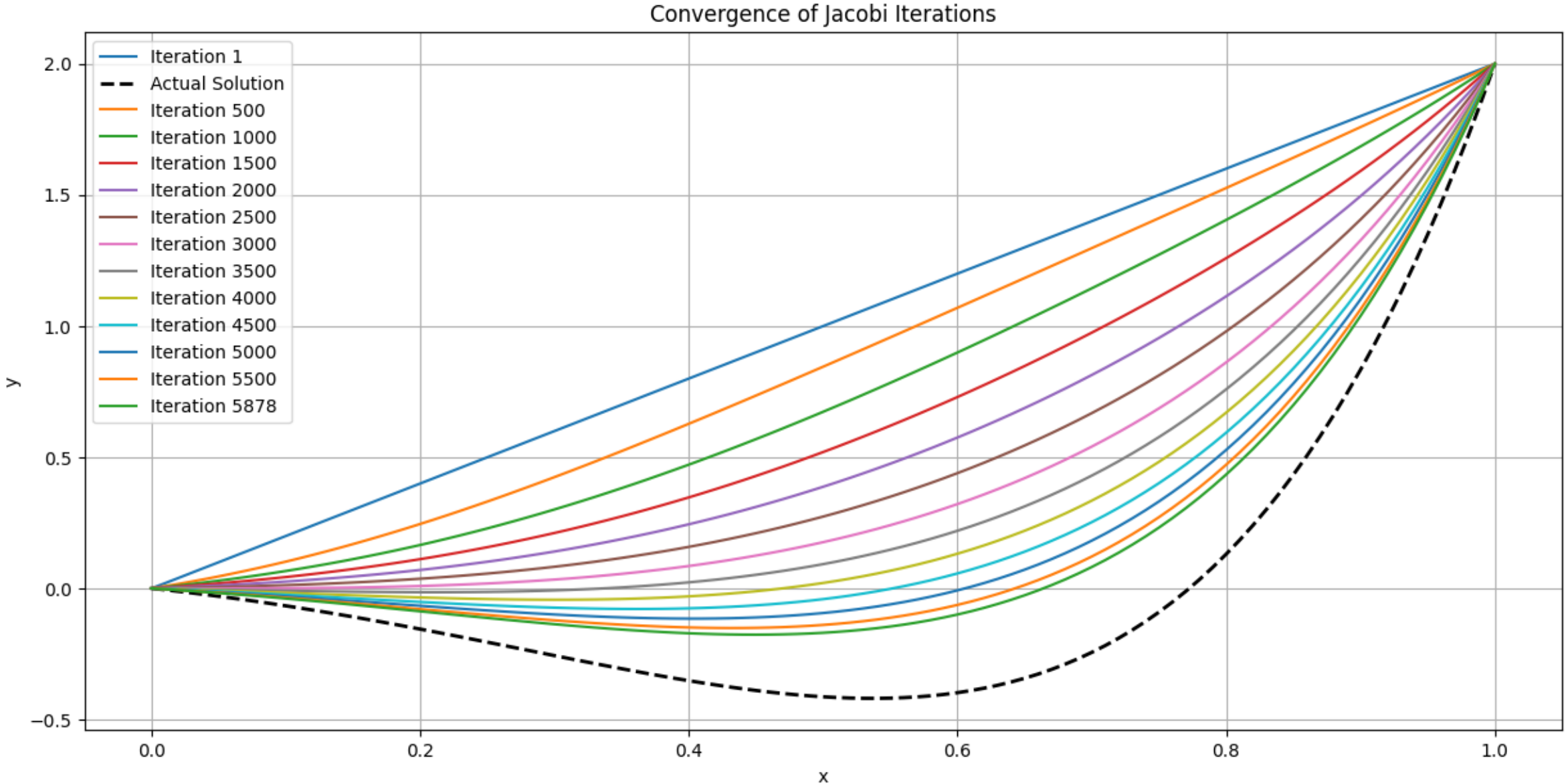

Second-Order ODE: $\frac{d^2x}{dt^2} = -\sin(x)$
Initial Conditions: $x(0) = 0$, $v(0) = 2$
x (position)
v (velocity)
Value
Time (t)
3
2
1
0
−1
−2
−3
0
10
20
30
40
50

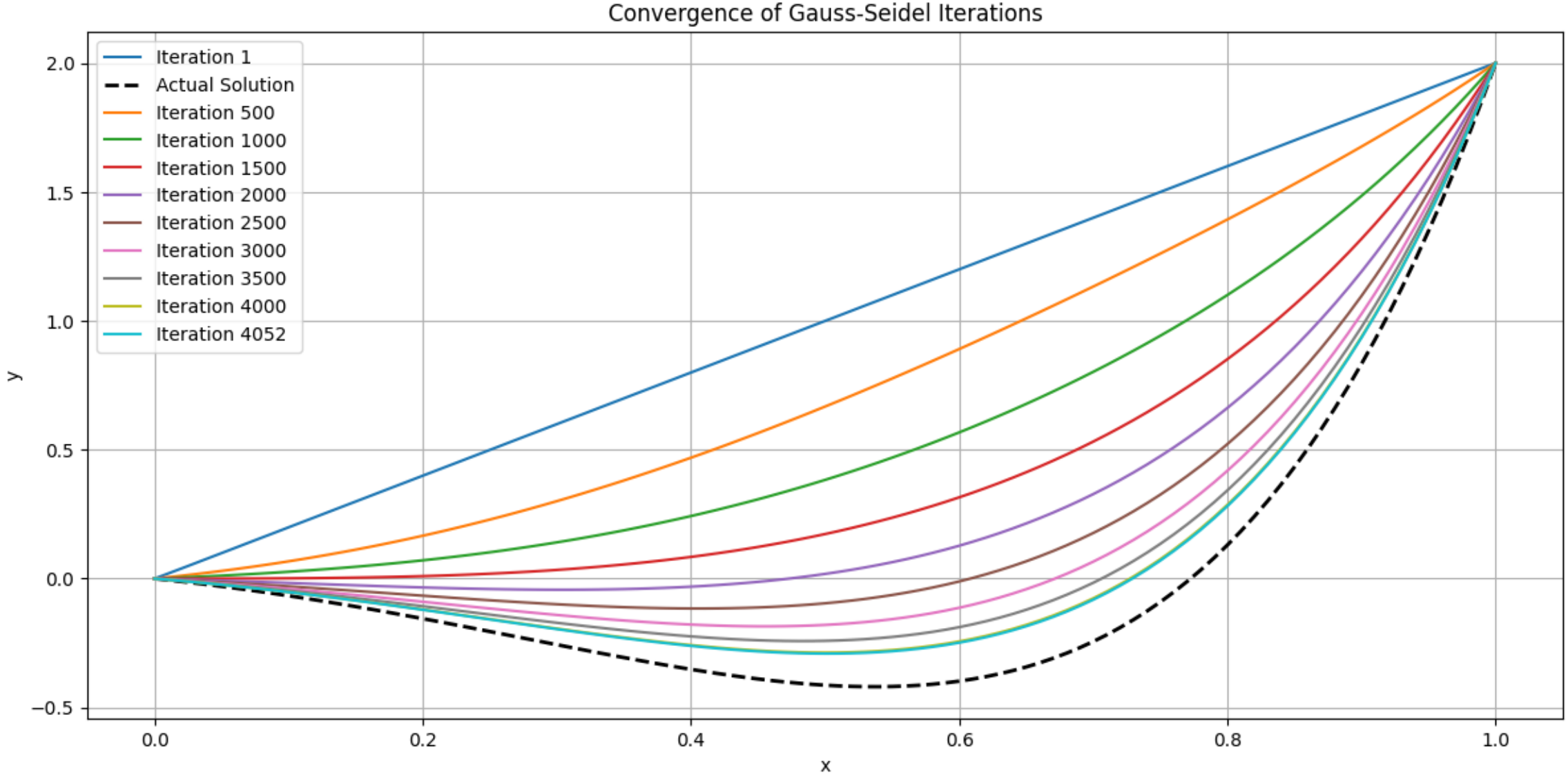

Second-Order ODE: $\frac{d^2x}{dt^2} = -\sin(x)$
Initial Conditions: $x(0) = 0$, $v(0) = 2.001$
x (position)
v (velocity)
Value
Time (t)
0
5
10
15
20
25
30
35
0
10
20
30
40
50

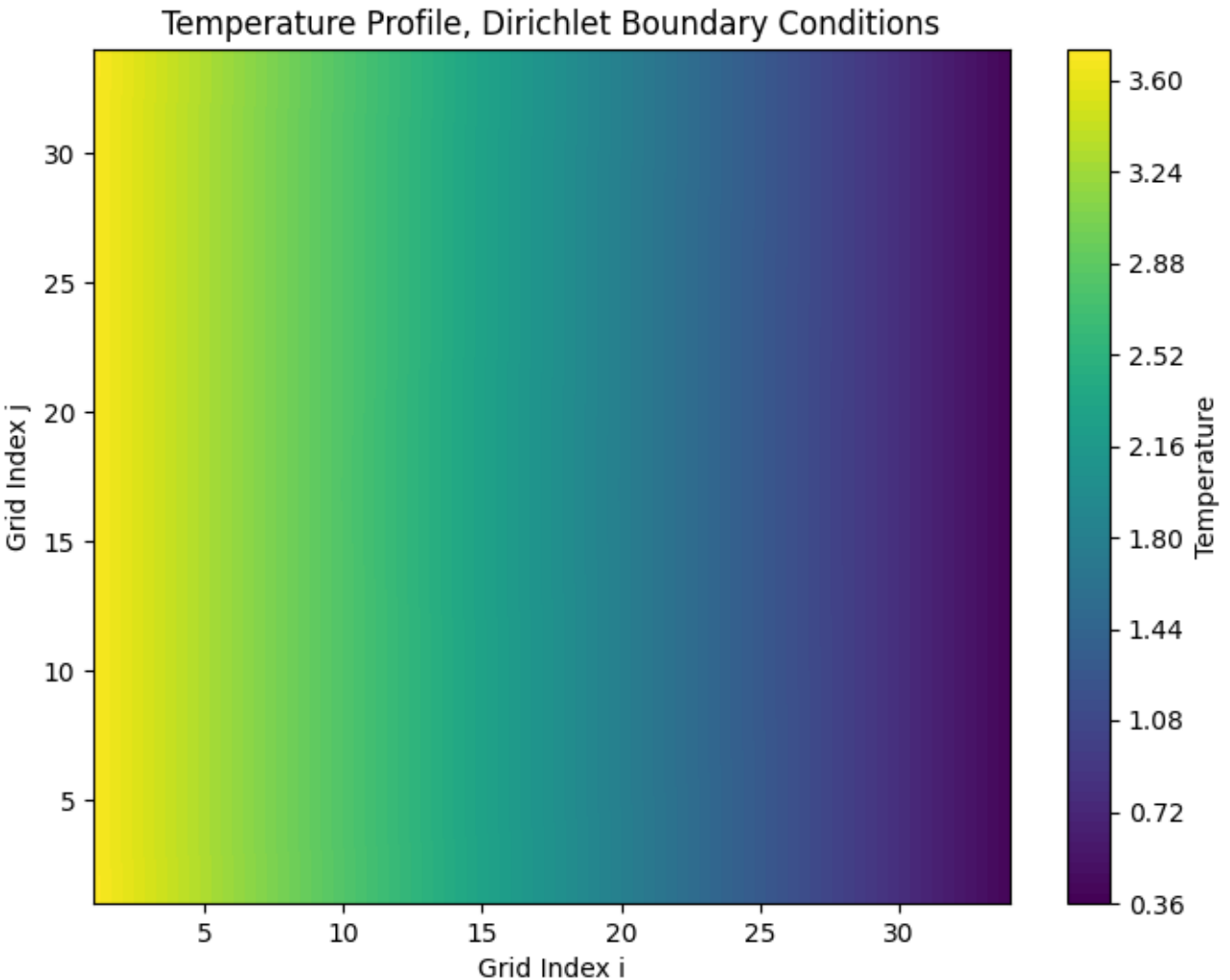

Second-Order ODE: $\frac{d^2x}{dt^2} = -\sin(x)$
Initial Conditions: $x(0) = 0$, $v(0) = 2.1$
x (position)
v (velocity)
Value
Time (t)
0
10
20
30
40
50
60

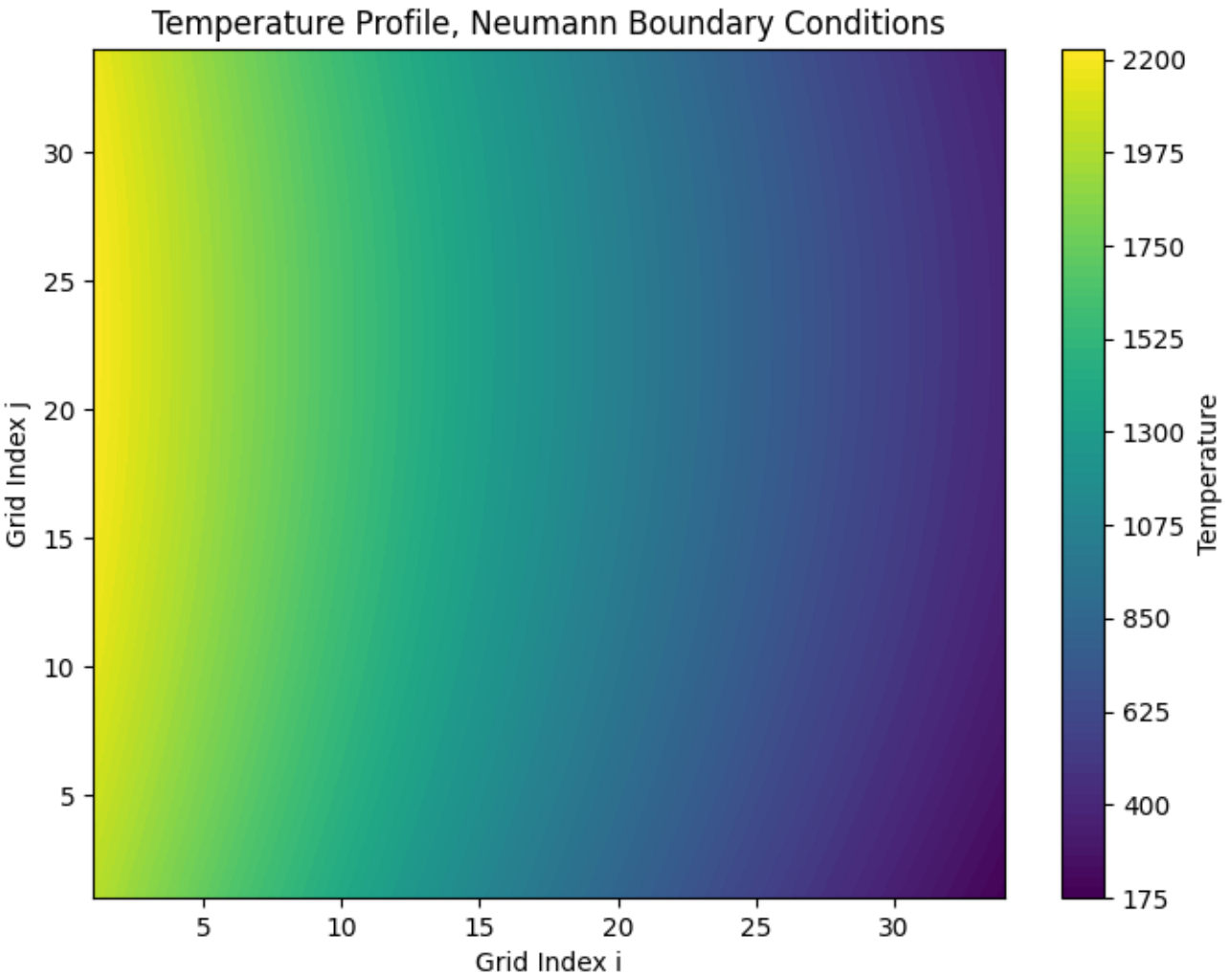

Displacement of Selected Particles Over Time (Superposing Pairs)
Particle 1
Particle 26 (superposing)
Particle 2
Particle 50 (superposing)
Particle 11
Particle 36 (superposing)
Displacement (y)
Time (t)
0.8
0.6
0.4
0.2
0.0
−0.2
0
5
10
15
20
25
30
35
40


Energy Conservation Check
Energy
Time (t)
0.0
0.2
0.4
0.6
0.8
1.0
1.2
0
5
10
15
20
25
30
35
40
Kinetic Energy
Potential Energy
Total Energy


Convergence of Jacobi Iterations
Iteration 1
Actual Solution
Iteration 500
Iteration 1000
Iteration 1500
Iteration 2000
Iteration 2500
Iteration 3000
Iteration 3500
Iteration 4000
Iteration 4500
Iteration 5000
Iteration 5500
Iteration 5878
2.0
1.5
1.0
0.5
0.0
−0.5
y
0.0
0.2
0.4
0.6
0.8
1.0
x


Convergence of Gauss-Seidel Iterations
Iteration 1
Actual Solution
Iteration 500
Iteration 1000
Iteration 1500
Iteration 2000
Iteration 2500
Iteration 3000
Iteration 3500
Iteration 4000
Iteration 4052
2.0
1.5
1.0
0.5
0.0
−0.5
y
0.0
0.2
0.4
0.6
0.8
1.0
x


Temperature Profile, Dirichlet Boundary Conditions
Grid Index j
Grid Index i
5
10
15
20
25
30
Temperature
3.60
3.24
2.88
2.52
2.16
1.80
1.44
1.08
0.72
0.36


Temperature Profile, Neumann Boundary Conditions
Grid Index j
Grid Index i
Temperature
5
10
15
20
25
30
2200
1975
1750
1525
1300
1075
850
625
400
175