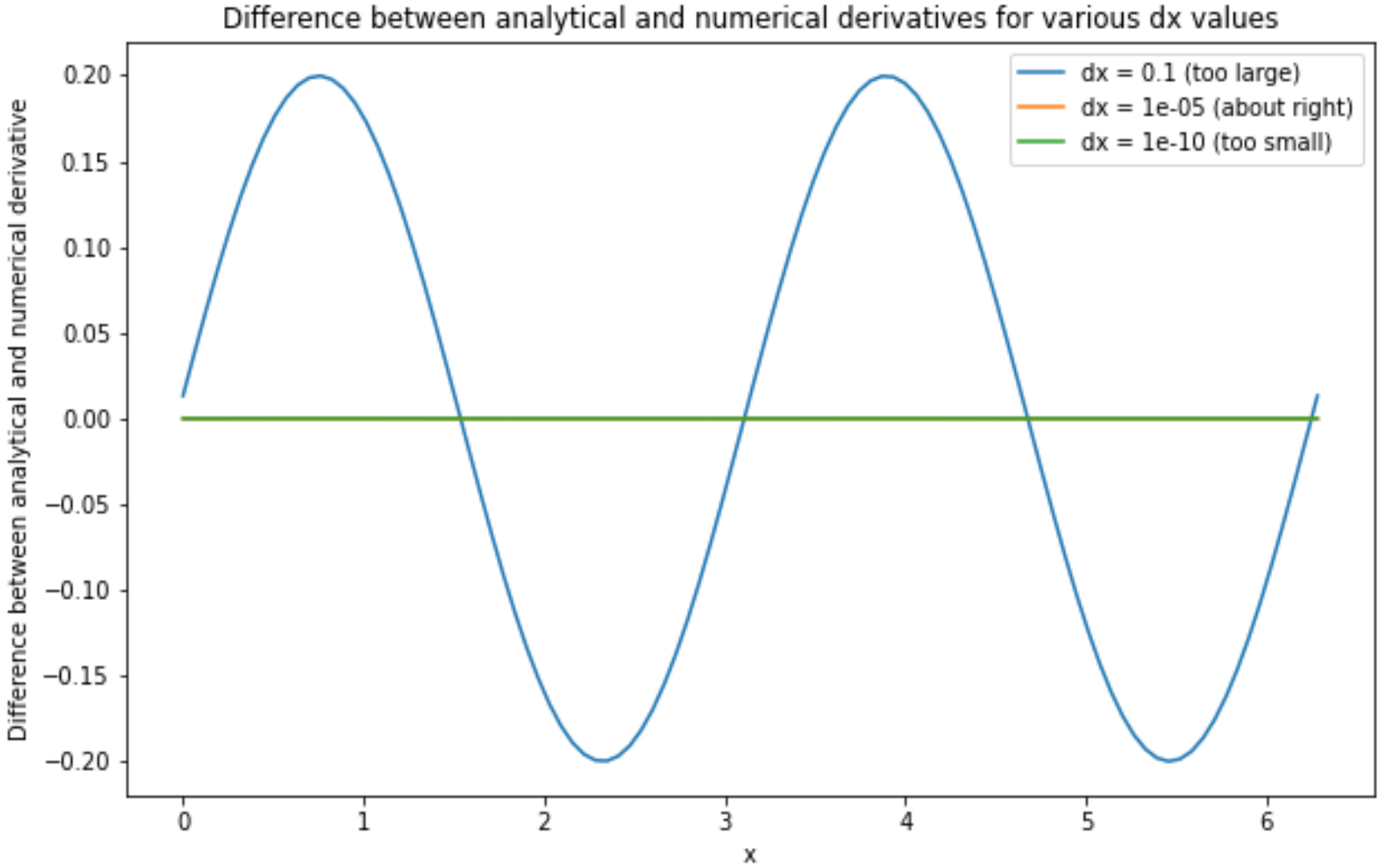
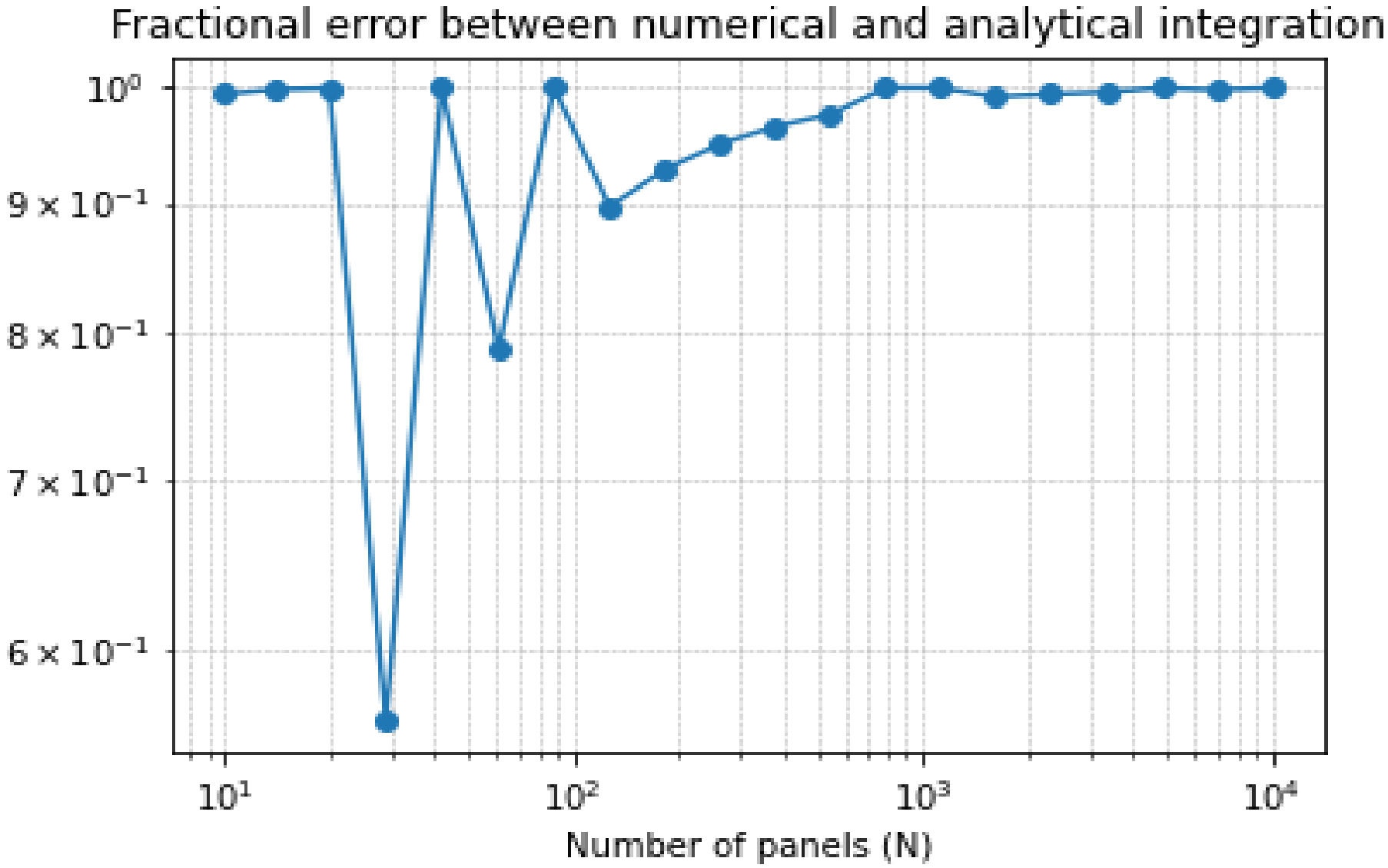
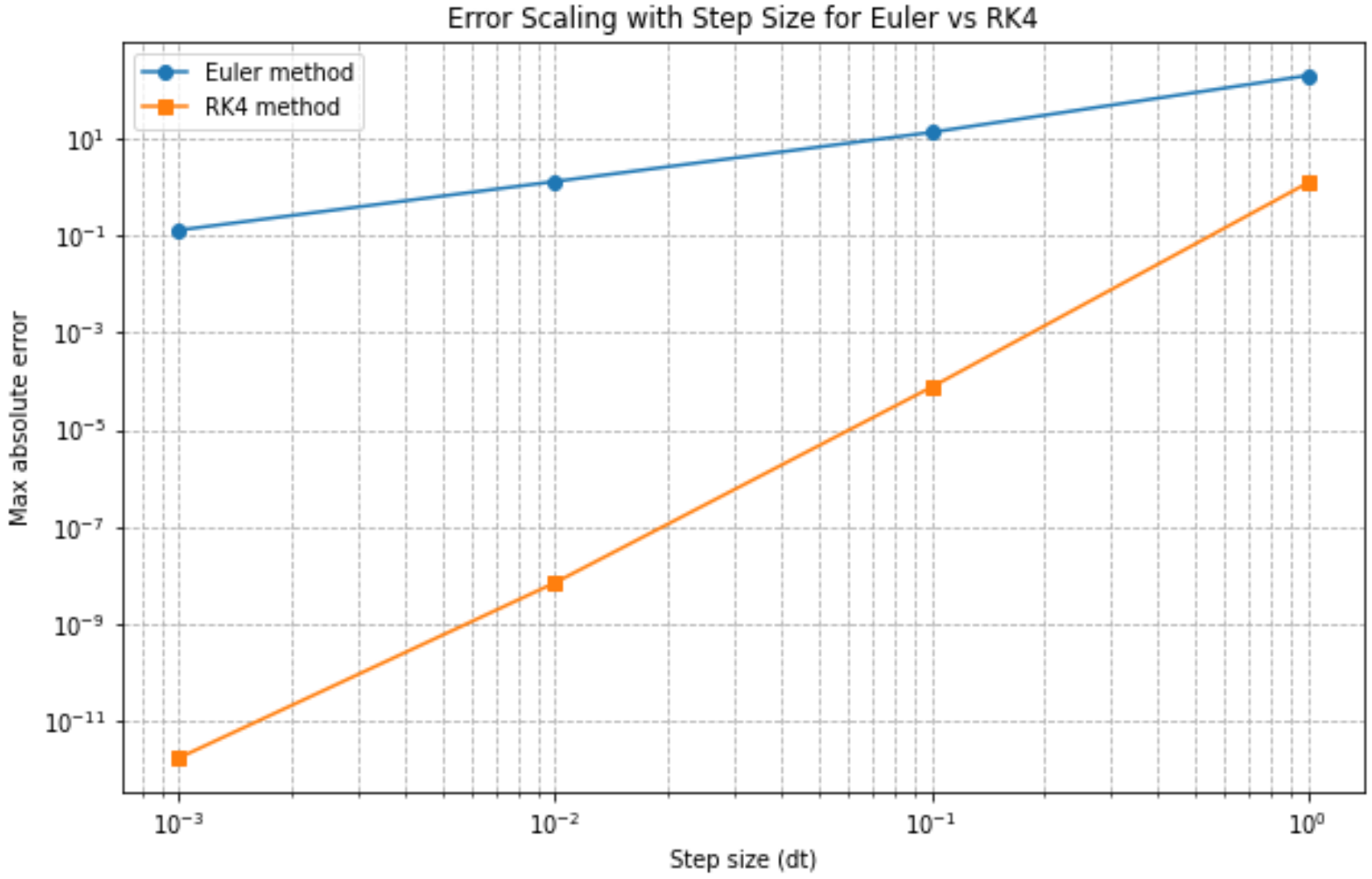
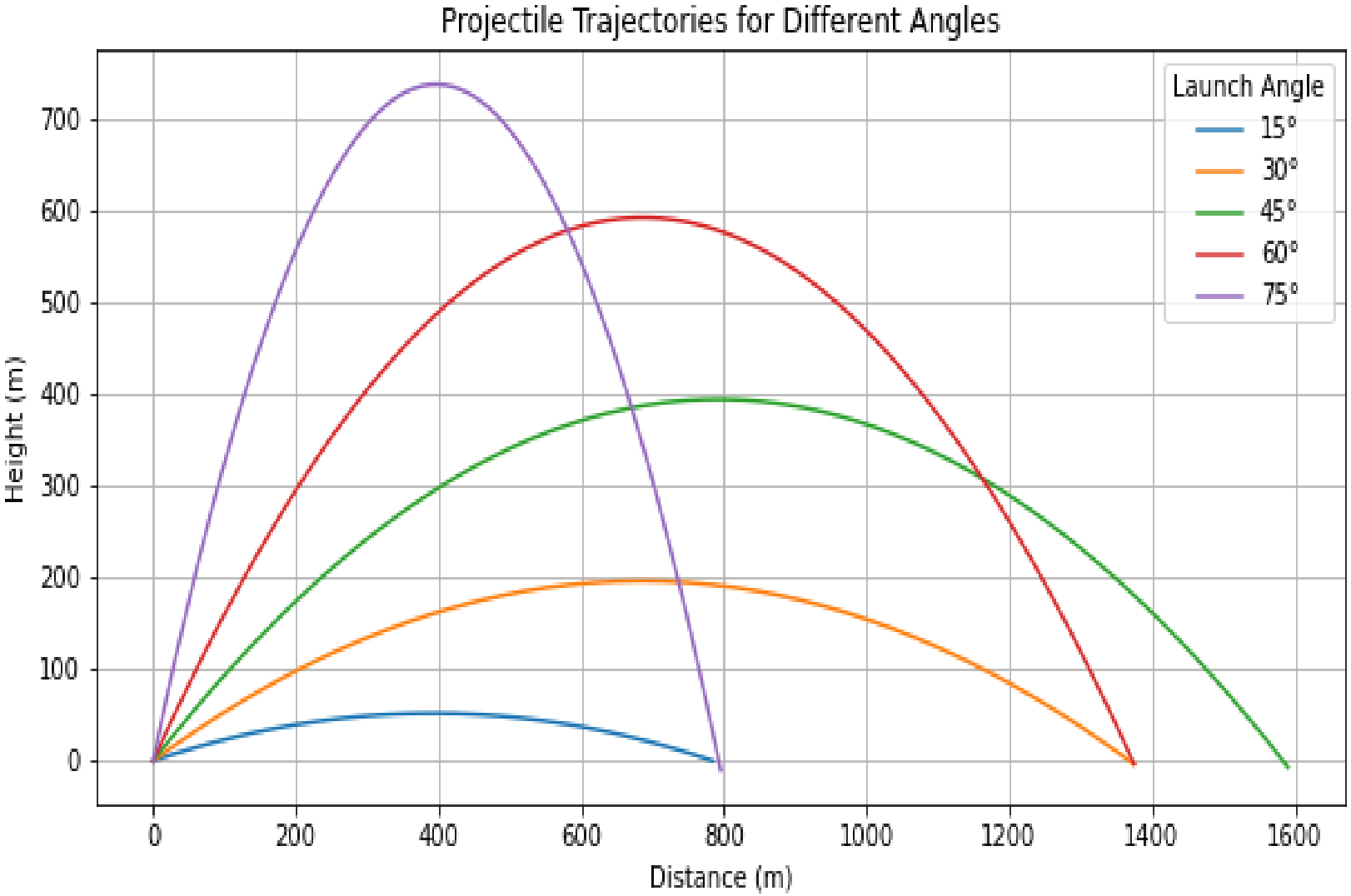
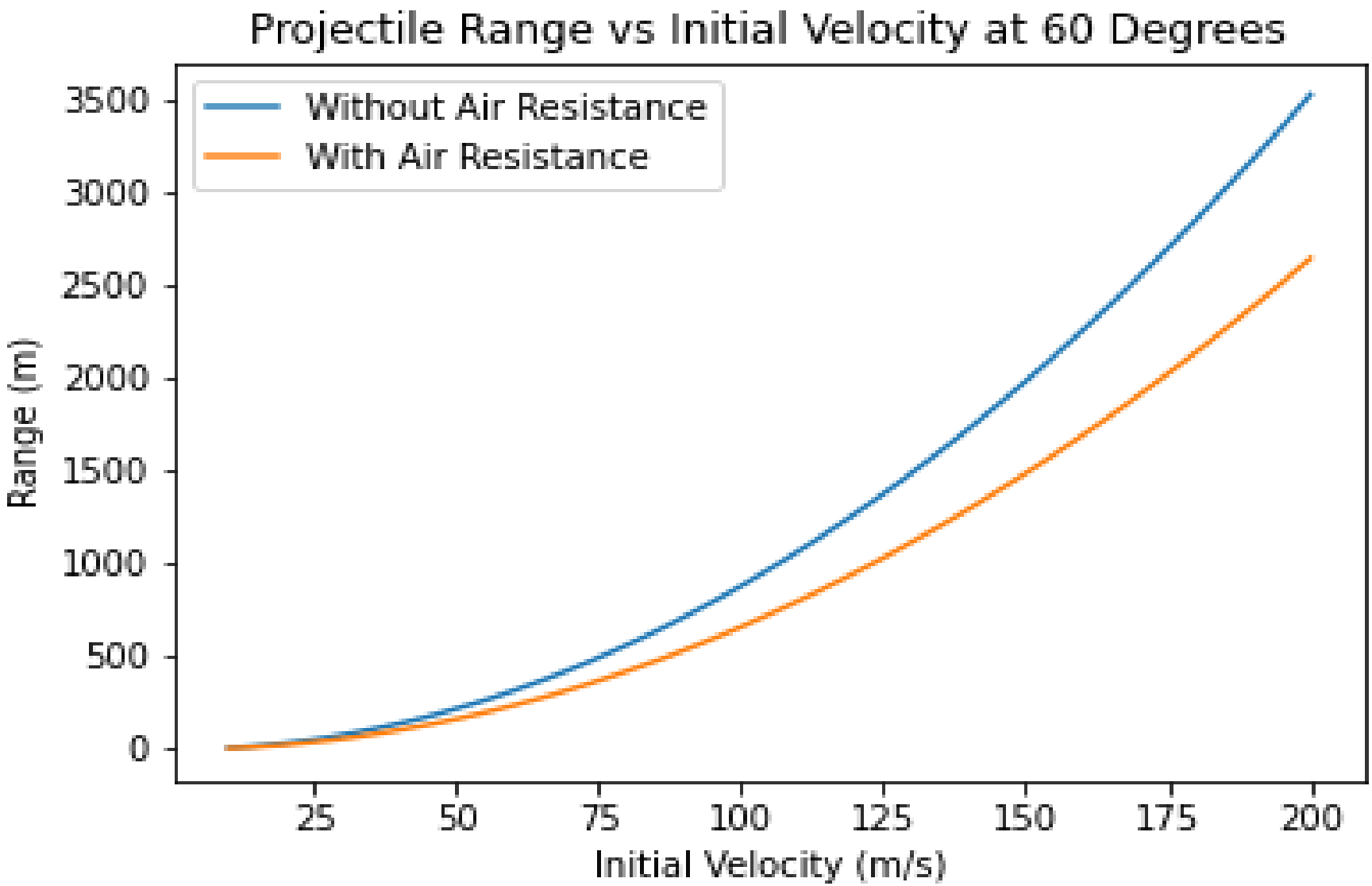
77840

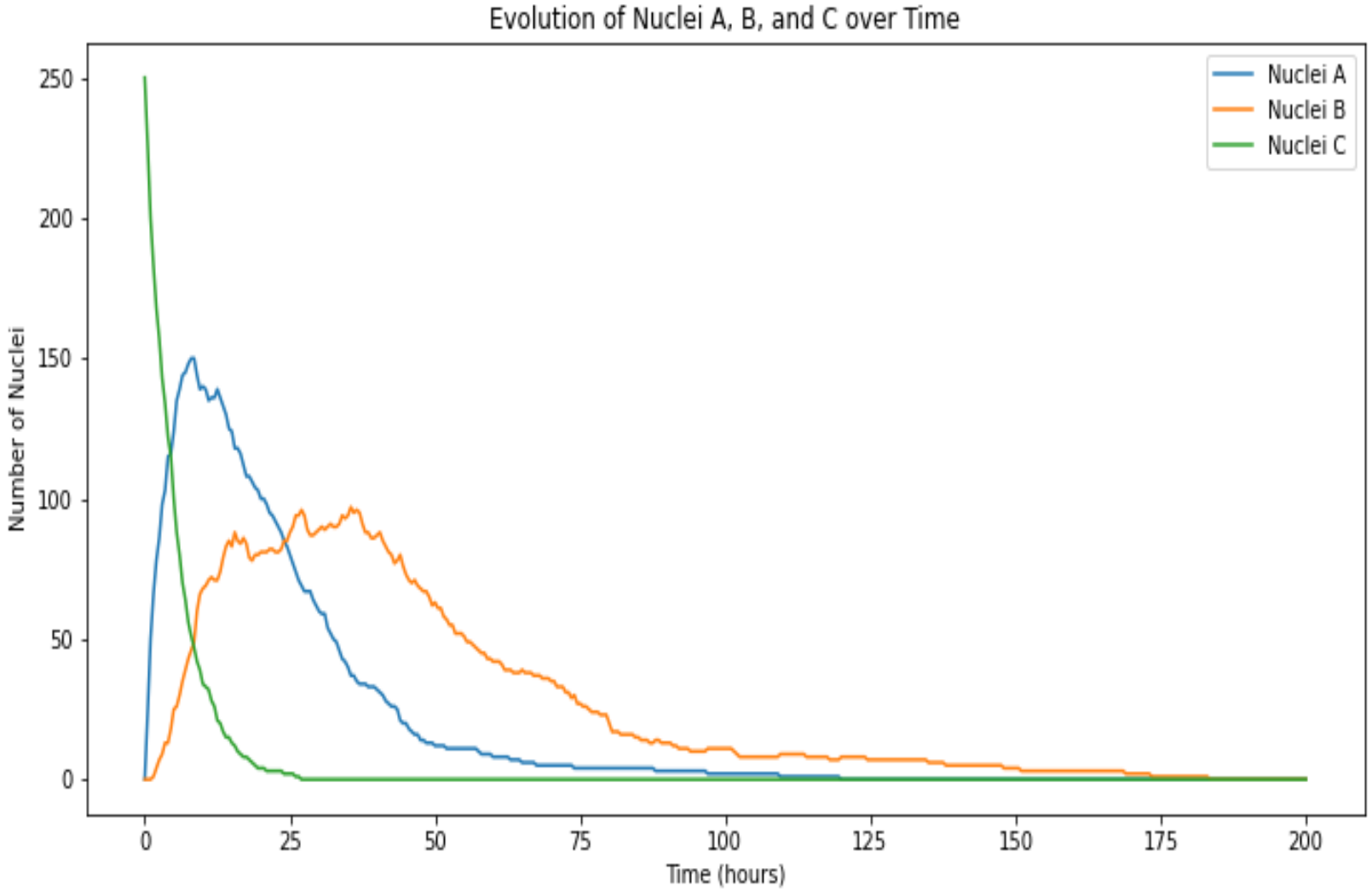

Difference between analytical and numerical derivatives for various dx values
dx = 0.1 (too large)
dx = 1e-05 (about right)
dx = 1e-10 (too small)
Difference between analytical and numerical derivative
0.20
0.15
0.10
0.05
0.00
−0.05
−0.10
−0.15
−0.20
0
1
2
3
4
5
6
x

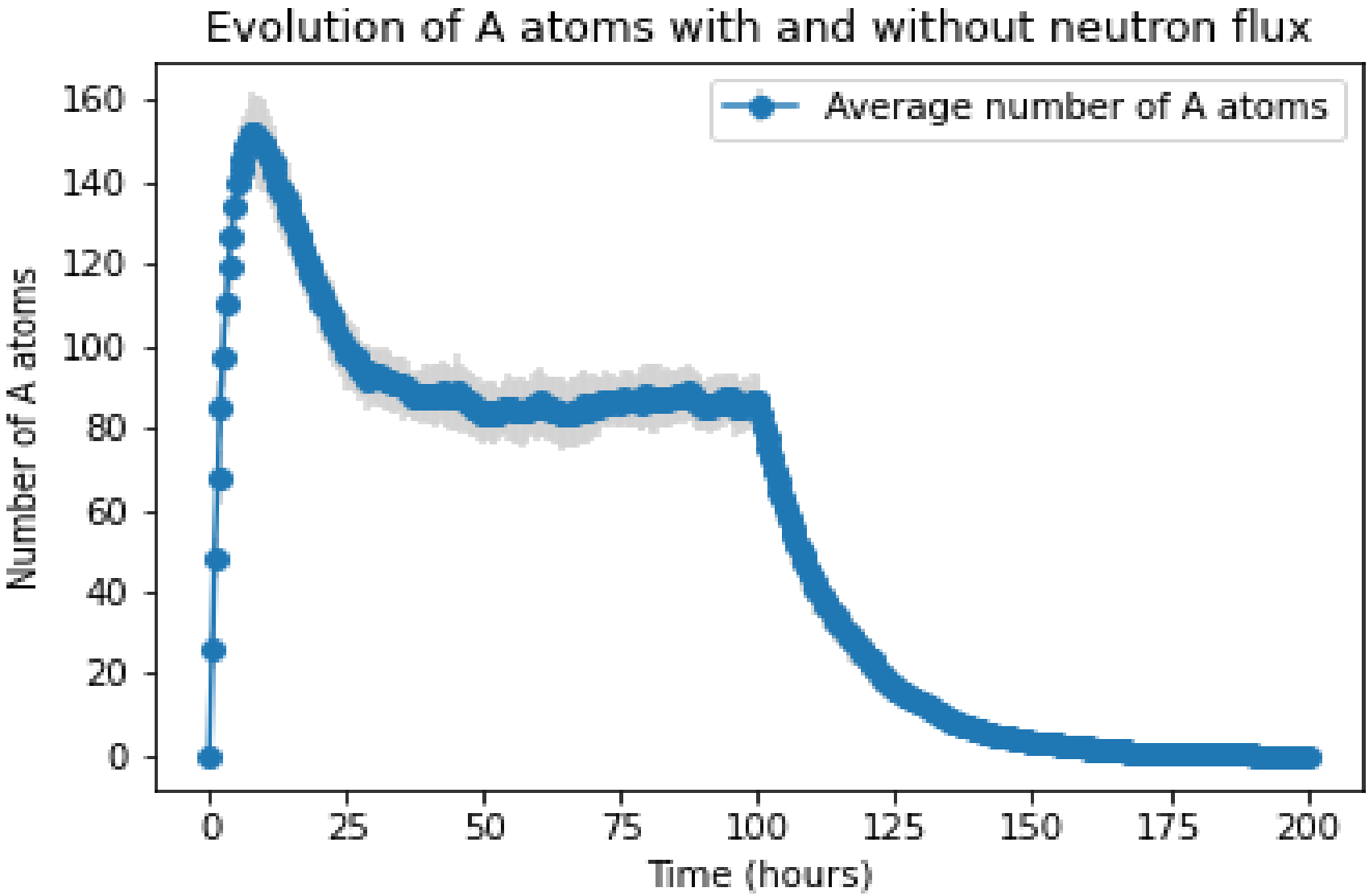

Fractional error between numerical and analytical integration
10^{0}
9×10^{-1}
8×10^{-1}
7×10^{-1}
6×10^{-1}
10^{1}
10^{2}
10^{3}
10^{4}
Number of panels (N)

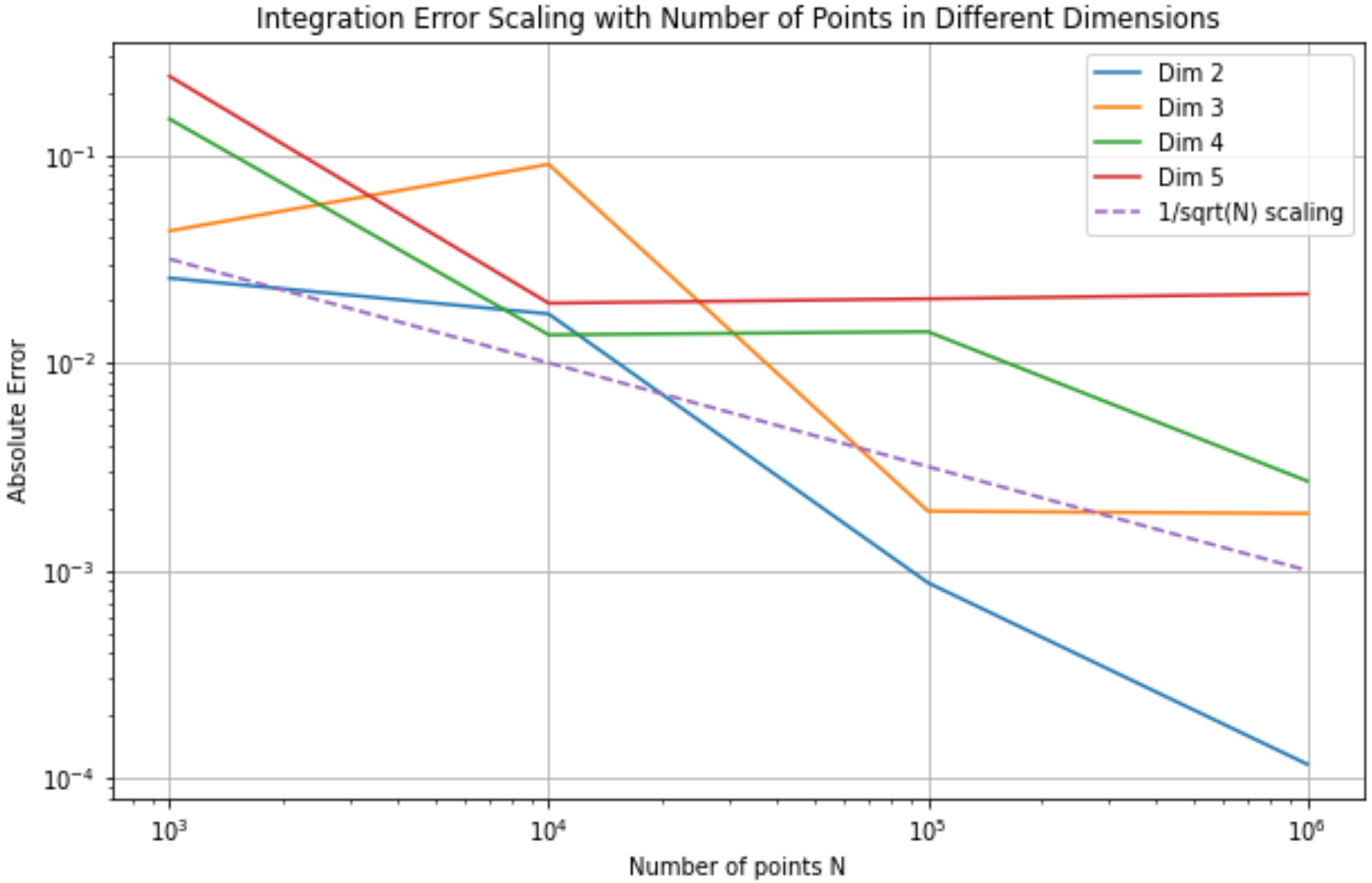

Error Scaling with Step Size for Euler vs RK4
Euler method
RK4 method
Max absolute error
10^{1}
10^{-1}
10^{-3}
10^{-5}
10^{-7}
10^{-9}
10^{-11}
10^{-3}
10^{-2}
10^{-1}
10^{0}
Step size (dt)

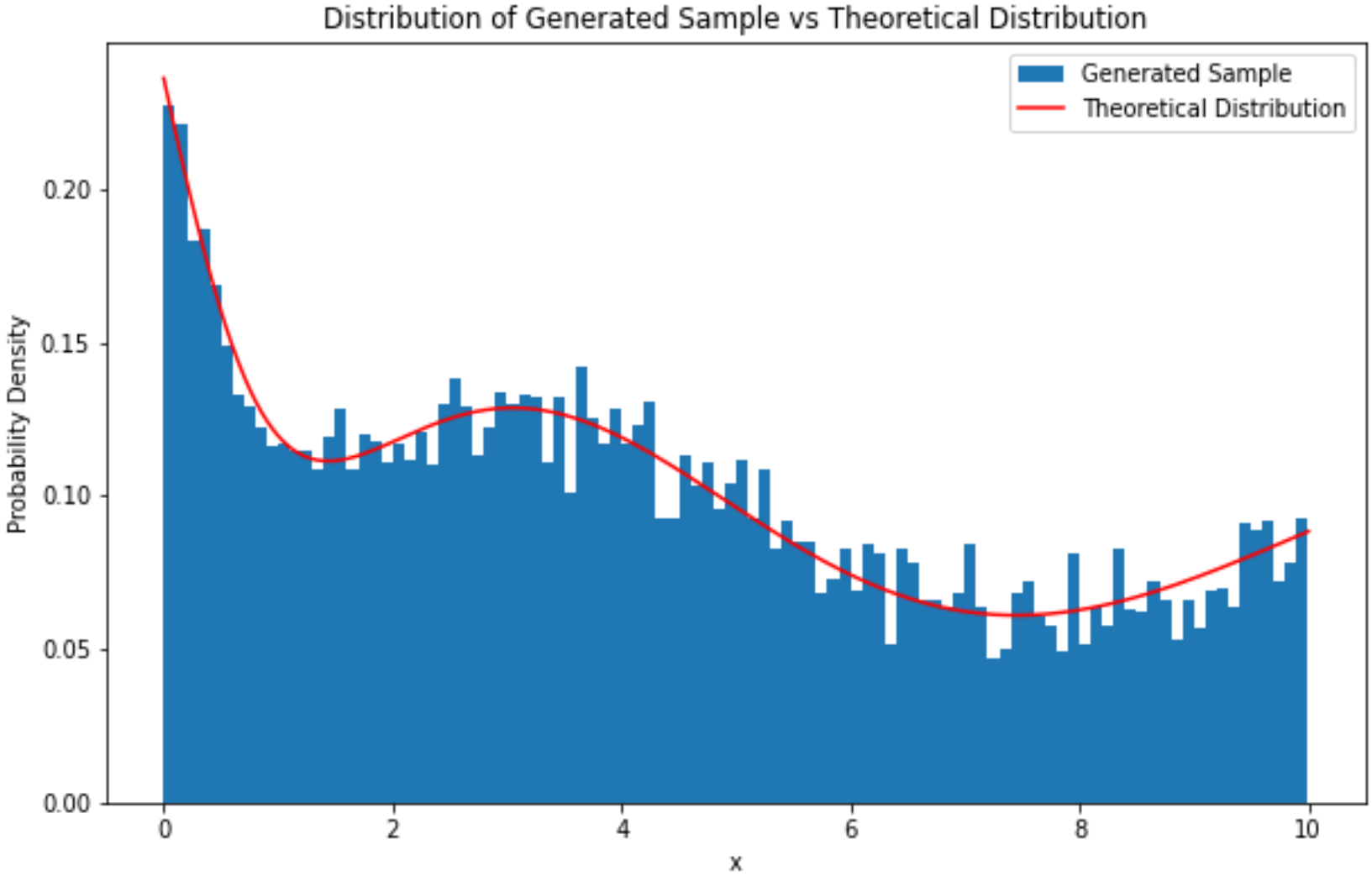

Projectile Trajectories for Different Angles
Launch Angle
15°
30°
45°
60°
75°
Height (m)
0
100
200
300
400
500
600
700
0
200
400
600
800
1000
1200
1400
1600
Distance (m)

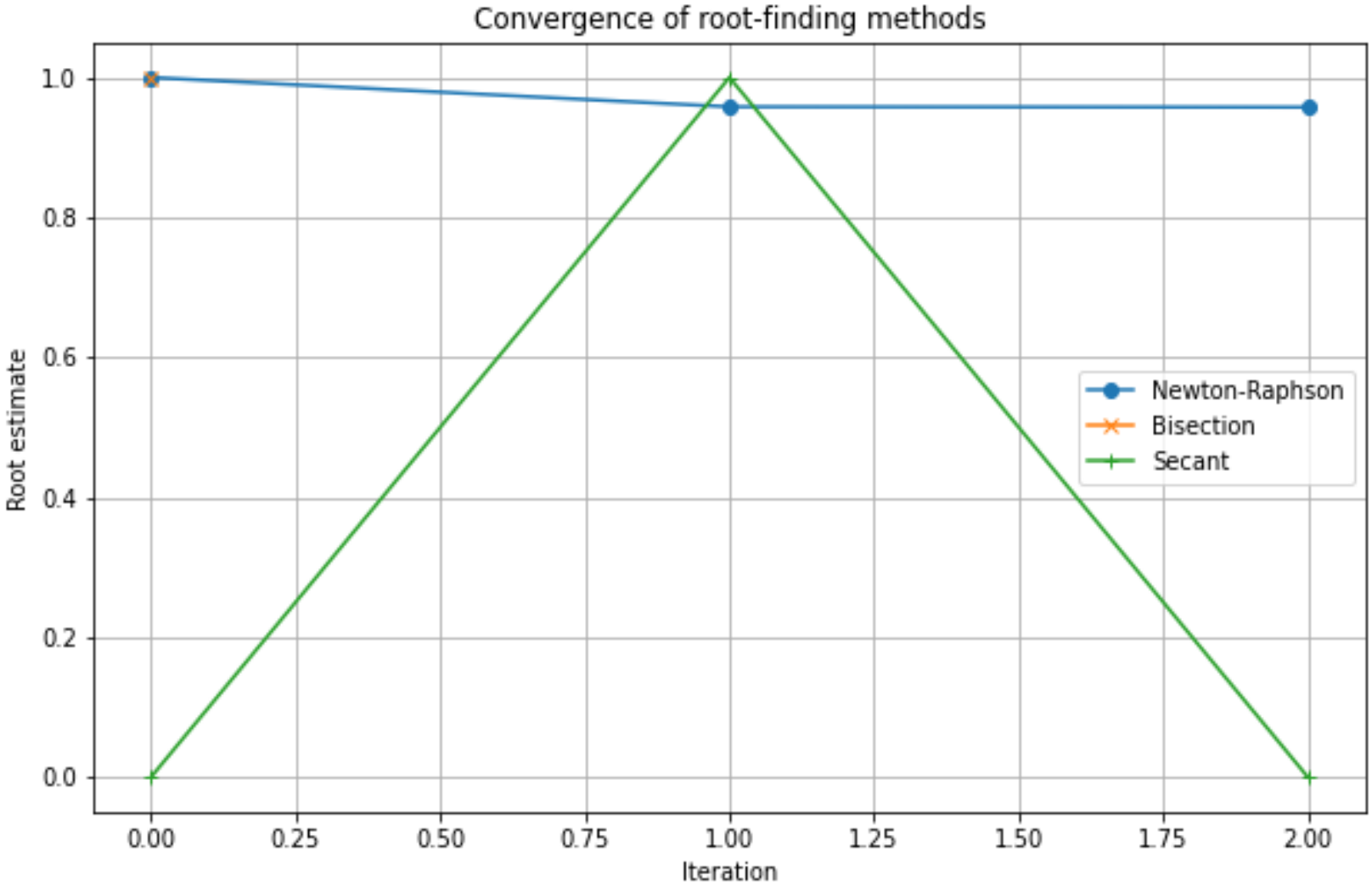

Projectile Range vs Initial Velocity at 60 Degrees
Without Air Resistance
With Air Resistance
Range (m)
3500
3000
2500
2000
1500
1000
500
0
25
50
75
100
125
150
175
200
Initial Velocity (m/s)

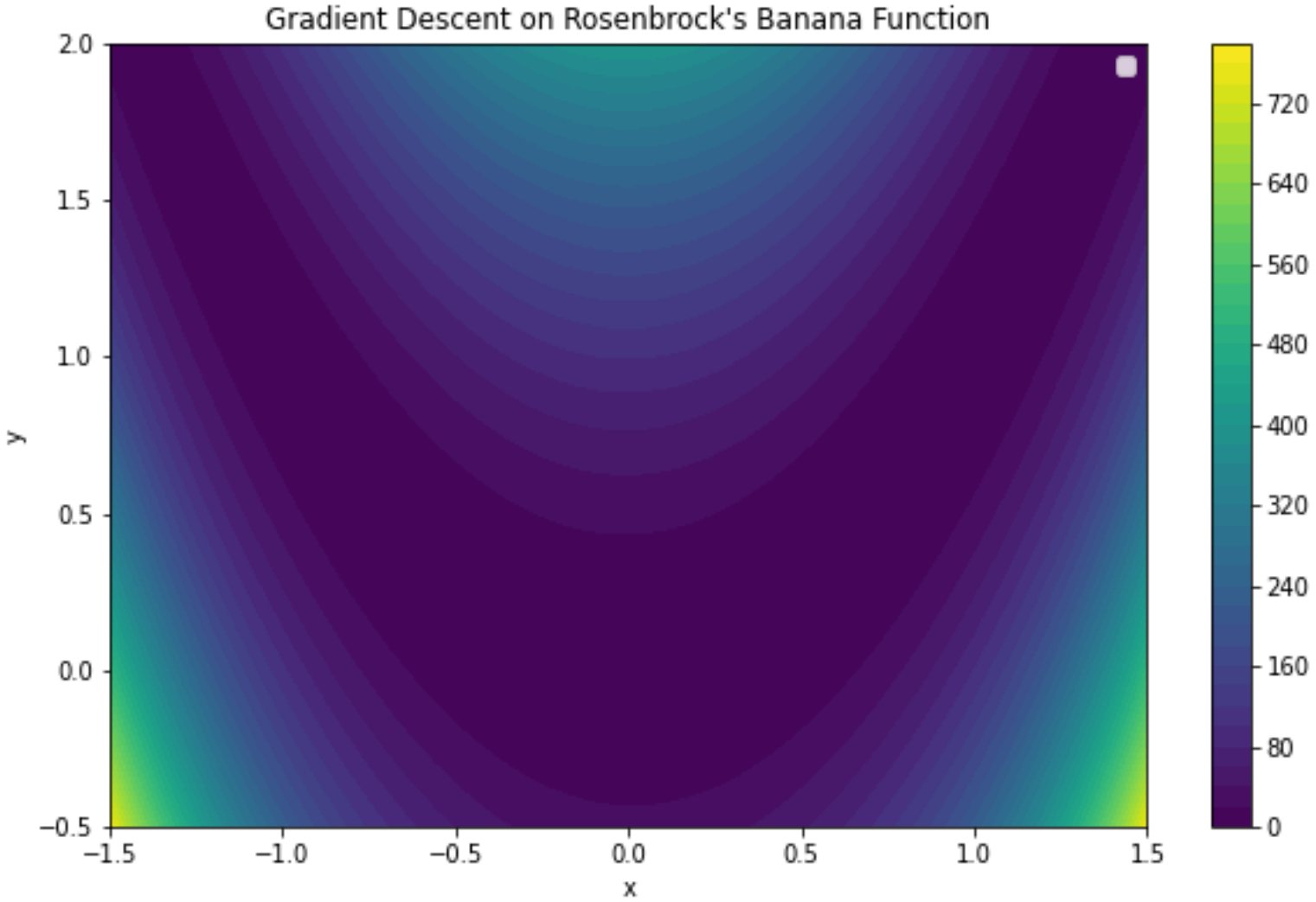

Evolution of Nuclei A, B, and C over Time
Nuclei A
Nuclei B
Nuclei C
Number of Nuclei
Time (hours)
0
50
100
150
200
250
0
25
50
75
100
125
150
175
200

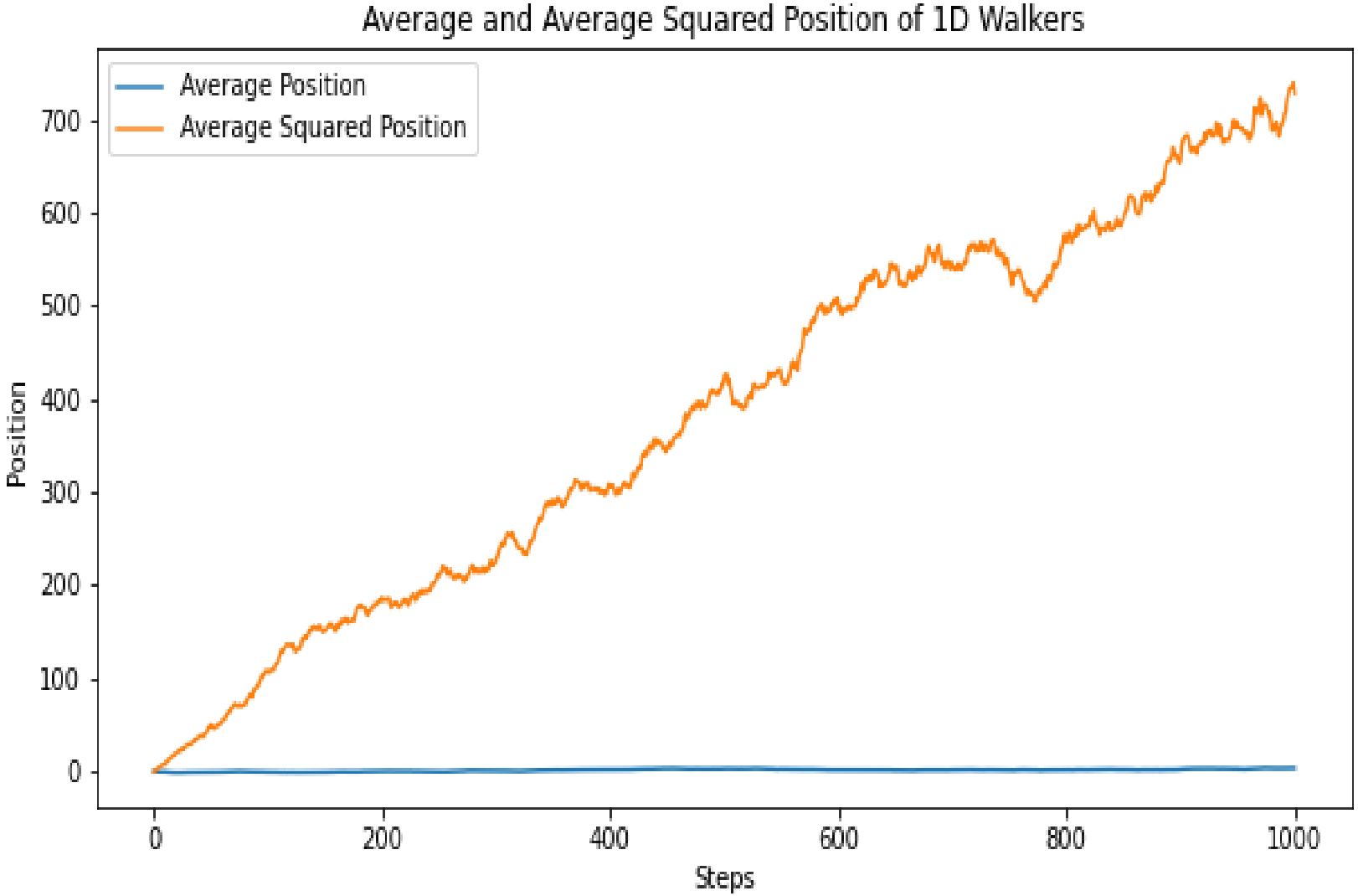

Evolution of A atoms with and without neutron flux
Average number of A atoms
Number of A atoms
Time (hours)
0
20
40
60
80
100
120
140
160
0
25
50
75
100
125
150
175
200

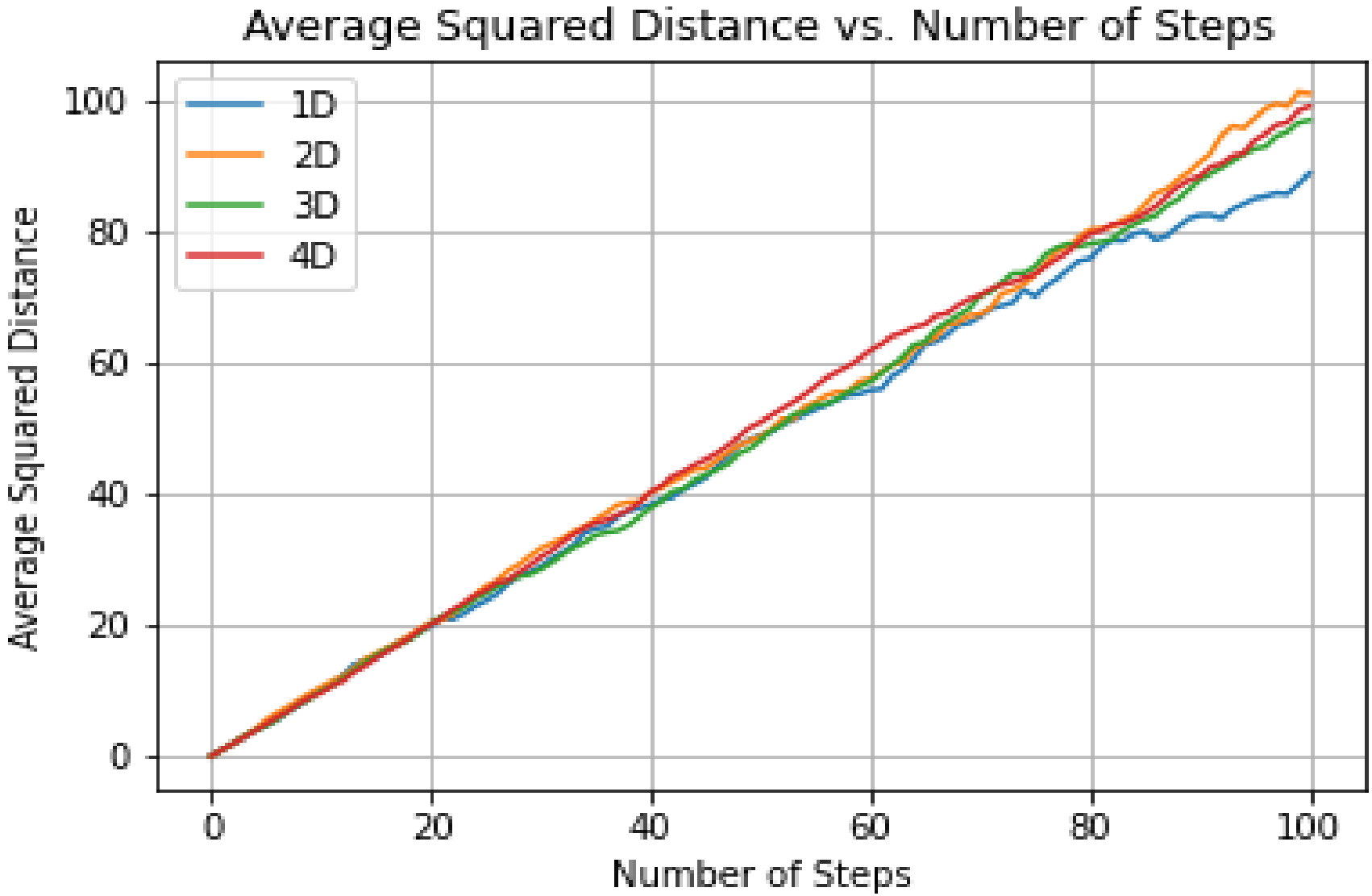

Integration Error Scaling with Number of Points in Different Dimensions
Dim 2
Dim 3
Dim 4
Dim 5
1/sqrt(N) scaling
Absolute Error
10^{-1}
10^{-2}
10^{-3}
10^{-4}
10^{3}
10^{4}
10^{5}
10^{6}
Number of points N

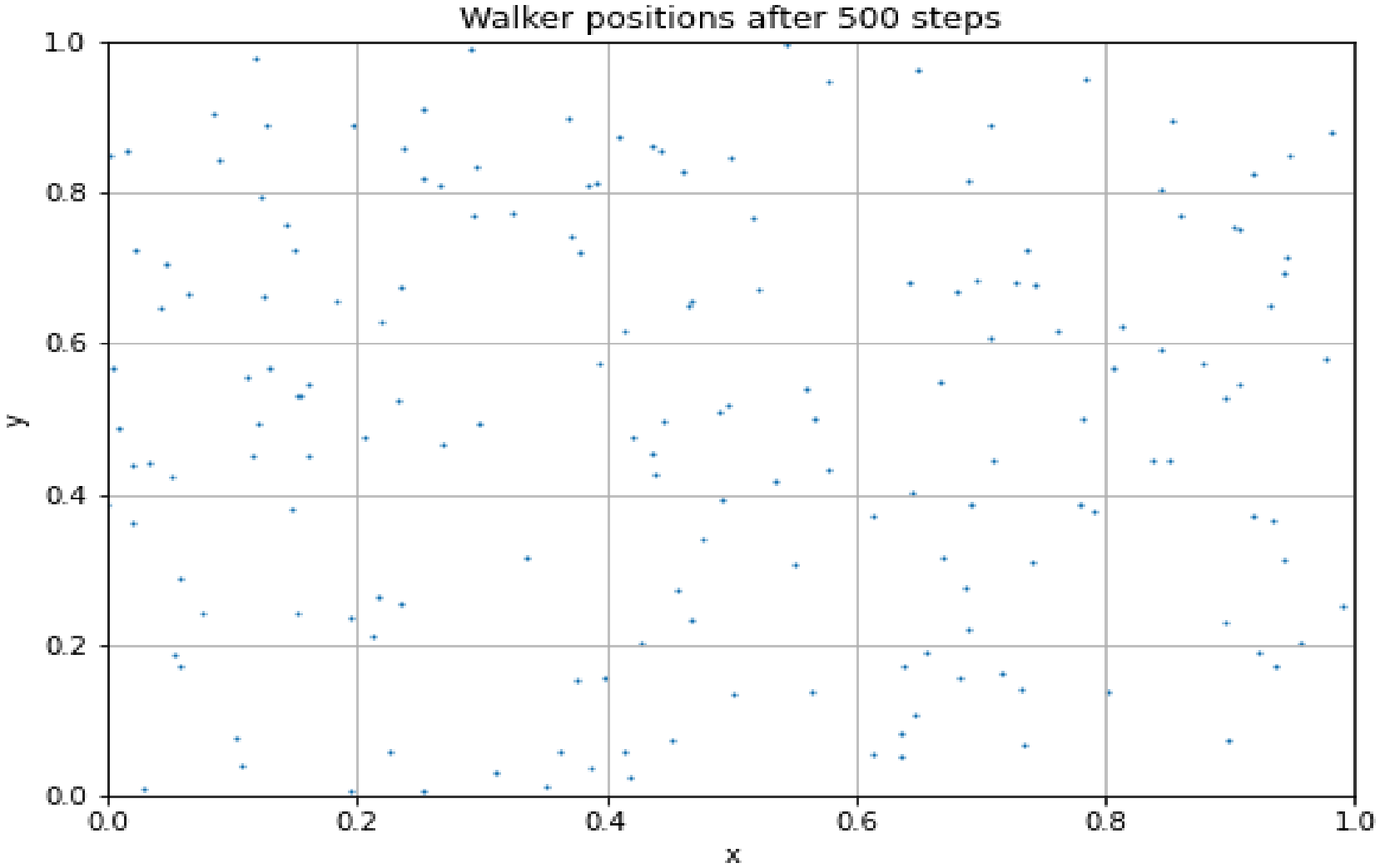

Distribution of Generated Sample vs Theoretical Distribution
Generated Sample
Theoretical Distribution
Probability Density
0.00
0.05
0.10
0.15
0.20
0
2
4
6
8
10
x


Convergence of root-finding methods
Root estimate
Iteration
1.0
0.8
0.6
0.4
0.2
0.0
0.00
0.25
0.50
0.75
1.00
1.25
1.50
1.75
2.00
Newton-Raphson
Bisection
Secant


Gradient Descent on Rosenbrock's Banana Function
2.0
1.5
1.0
0.5
0.0
−0.5
y
−1.5
−1.0
−0.5
0.0
0.5
1.0
1.5
x
720
640
560
480
400
320
240
160
80
0


Average and Average Squared Position of 1D Walkers
Average Position
Average Squared Position
Position
Steps
0
100
200
300
400
500
600
700
0
200
400
600
800
1000


Average Squared Distance vs. Number of Steps
1D
2D
3D
4D
Average Squared Distance
Number of Steps
0
20
40
60
80
100


Walker positions after 500 steps
1.0
0.8
0.6
0.4
0.2
0.0
y
0.0
0.2
0.4
0.6
0.8
1.0
x

AI?