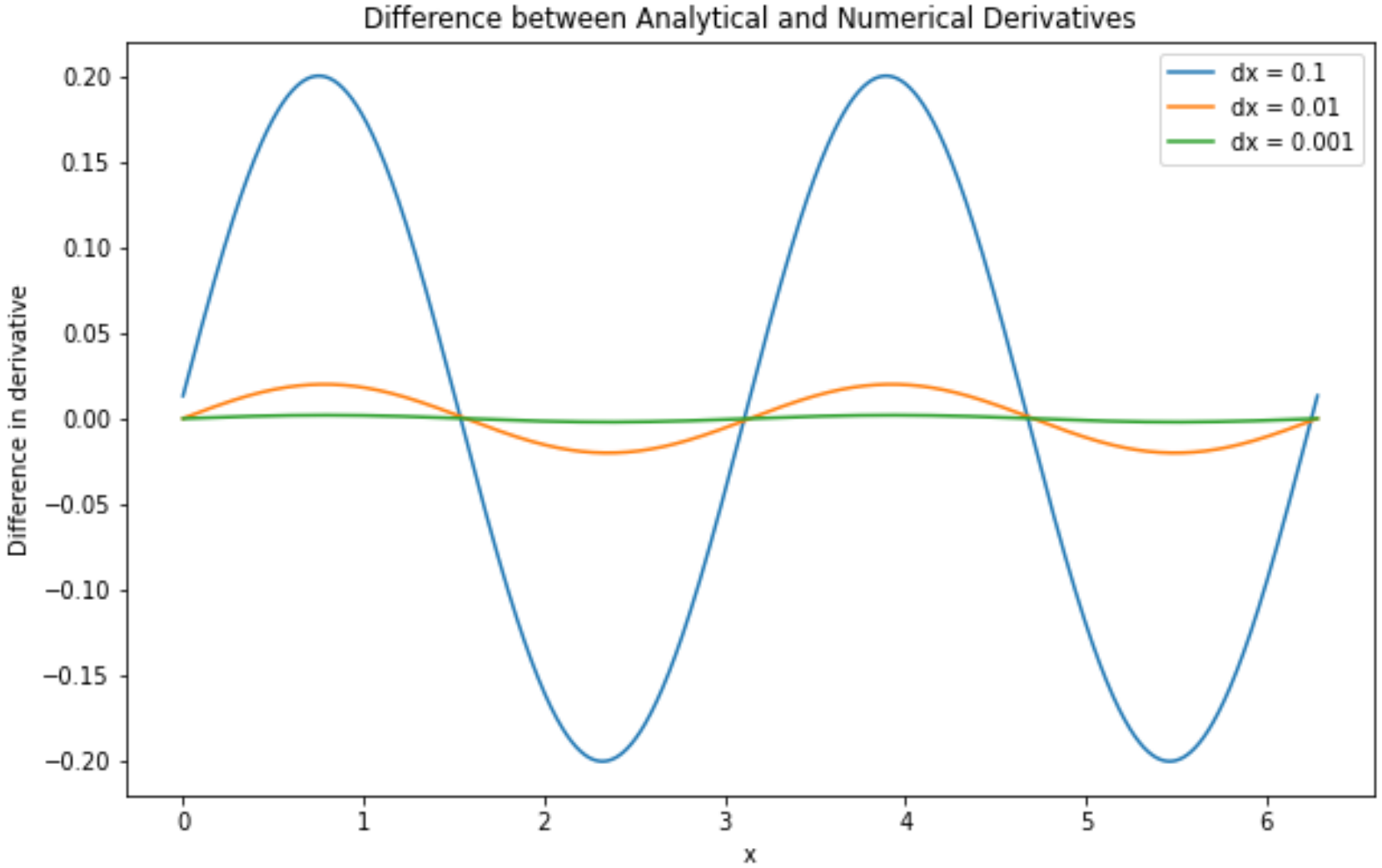
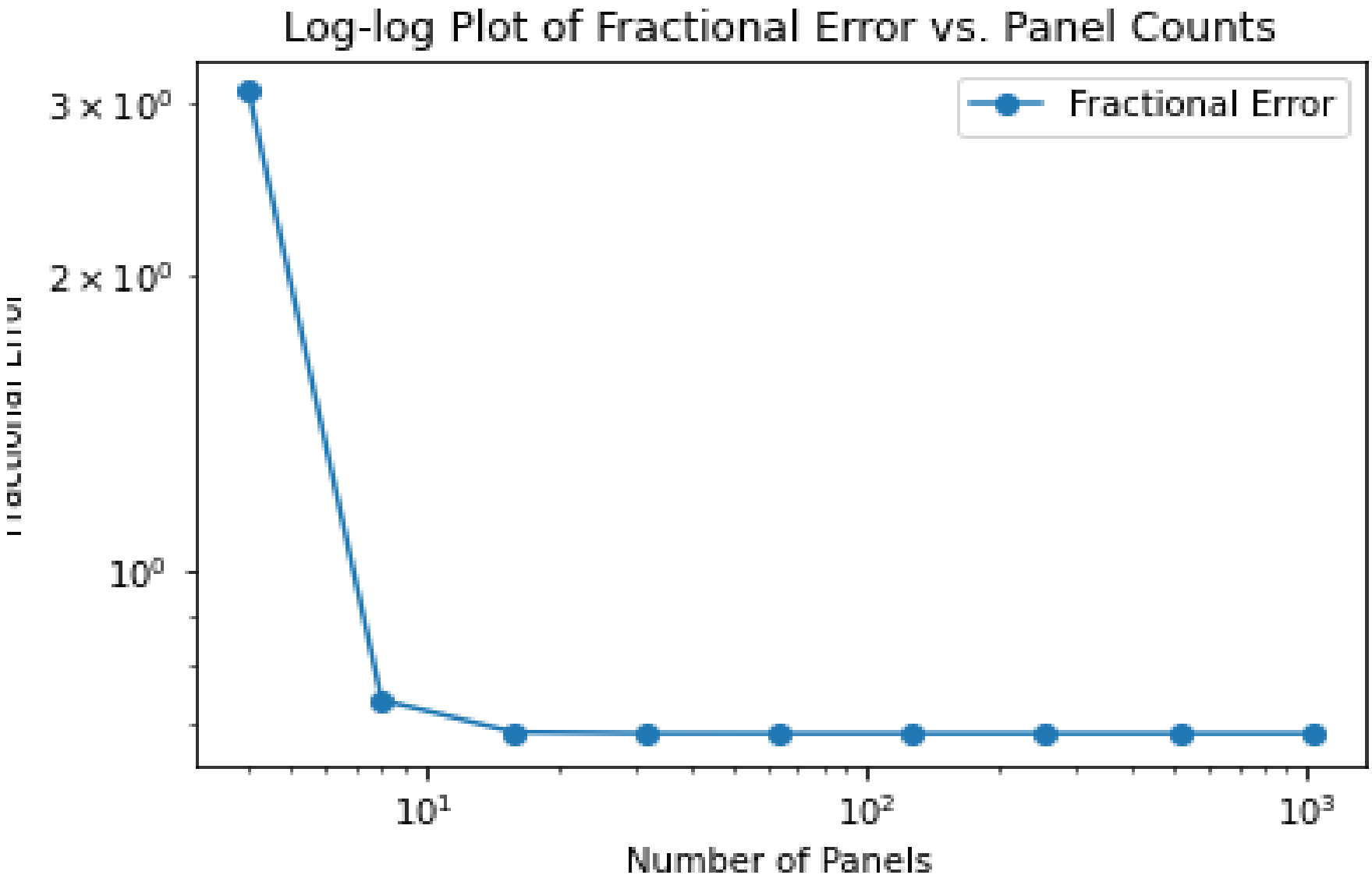
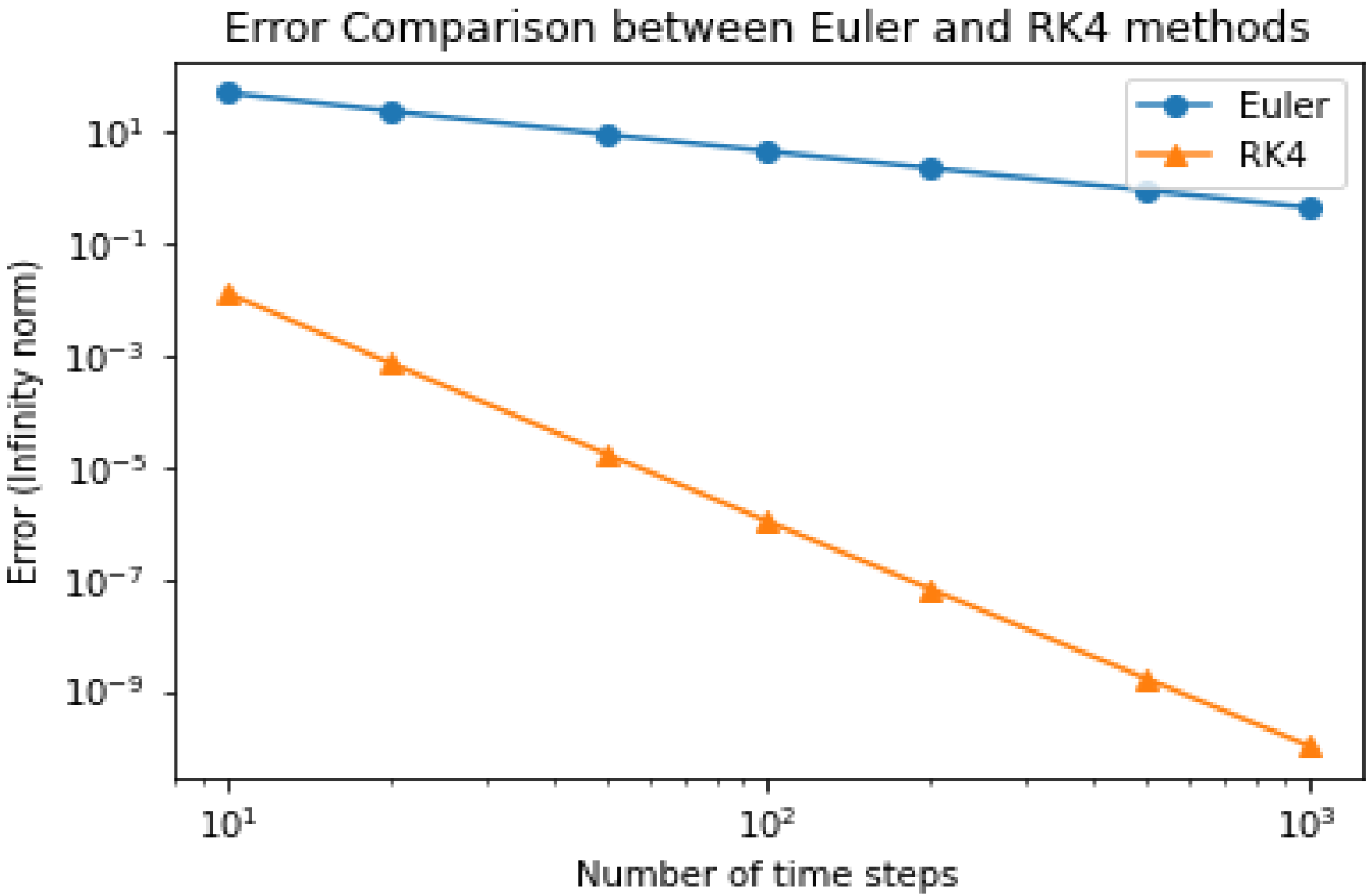
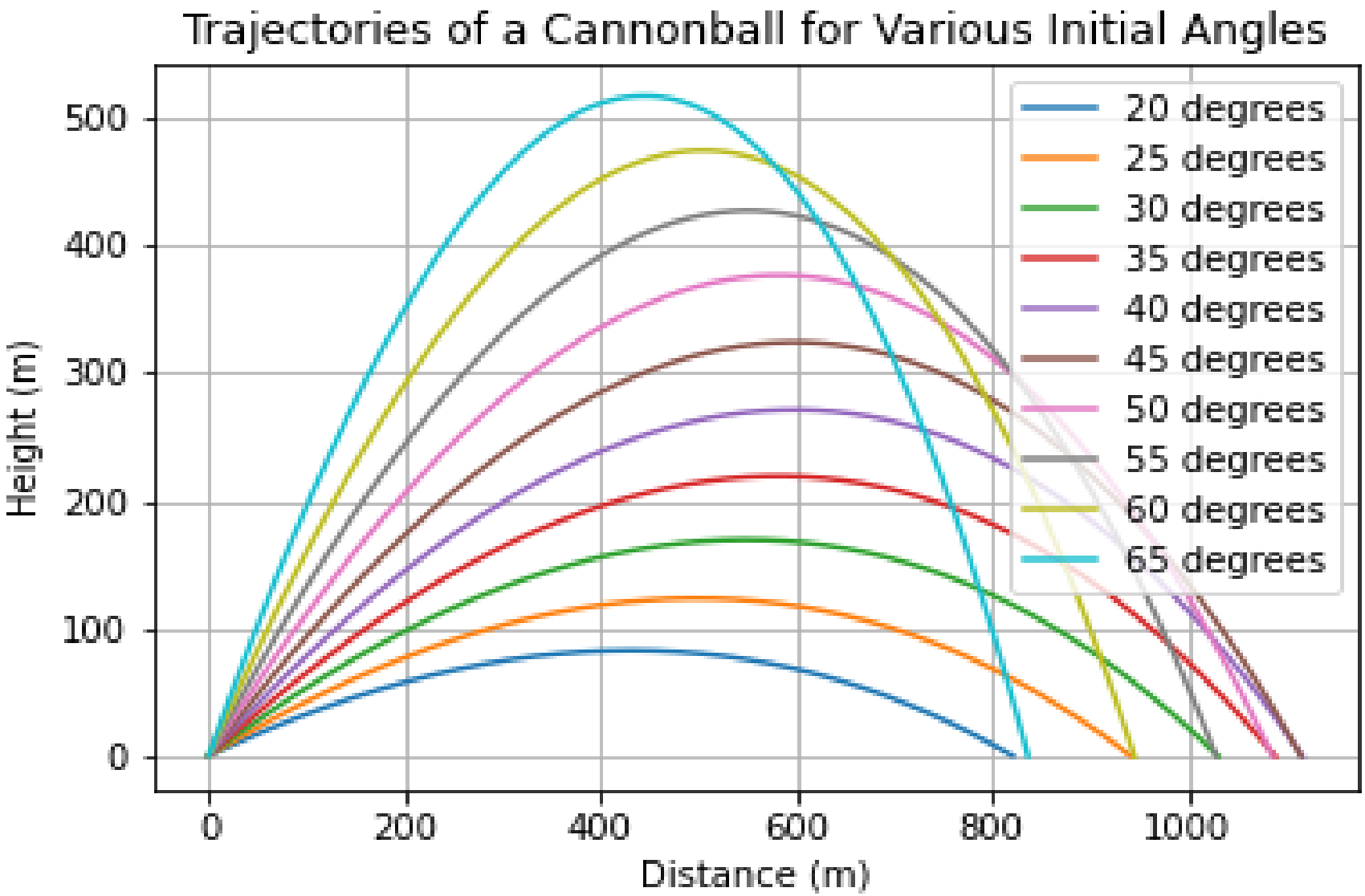
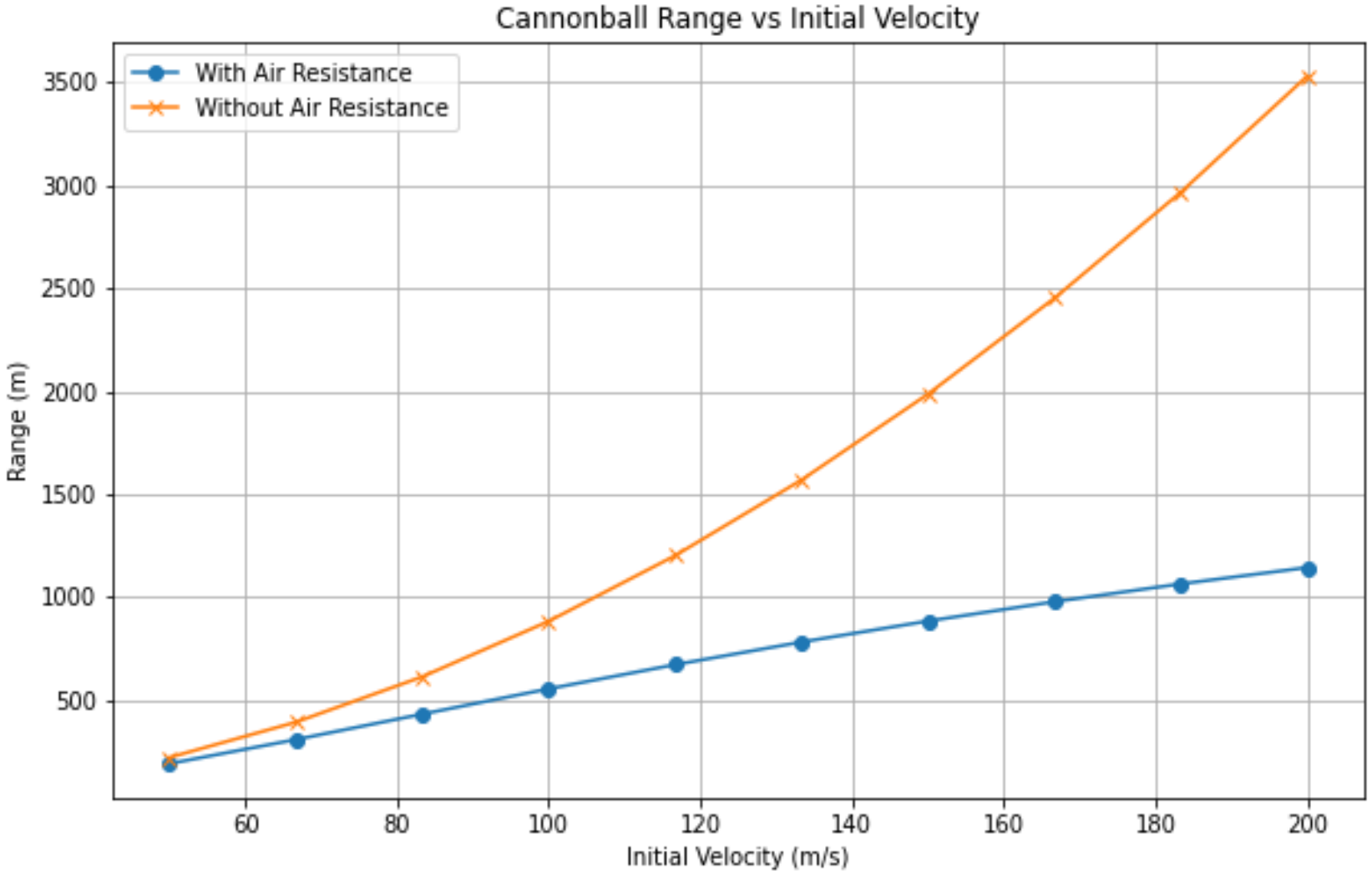
25432

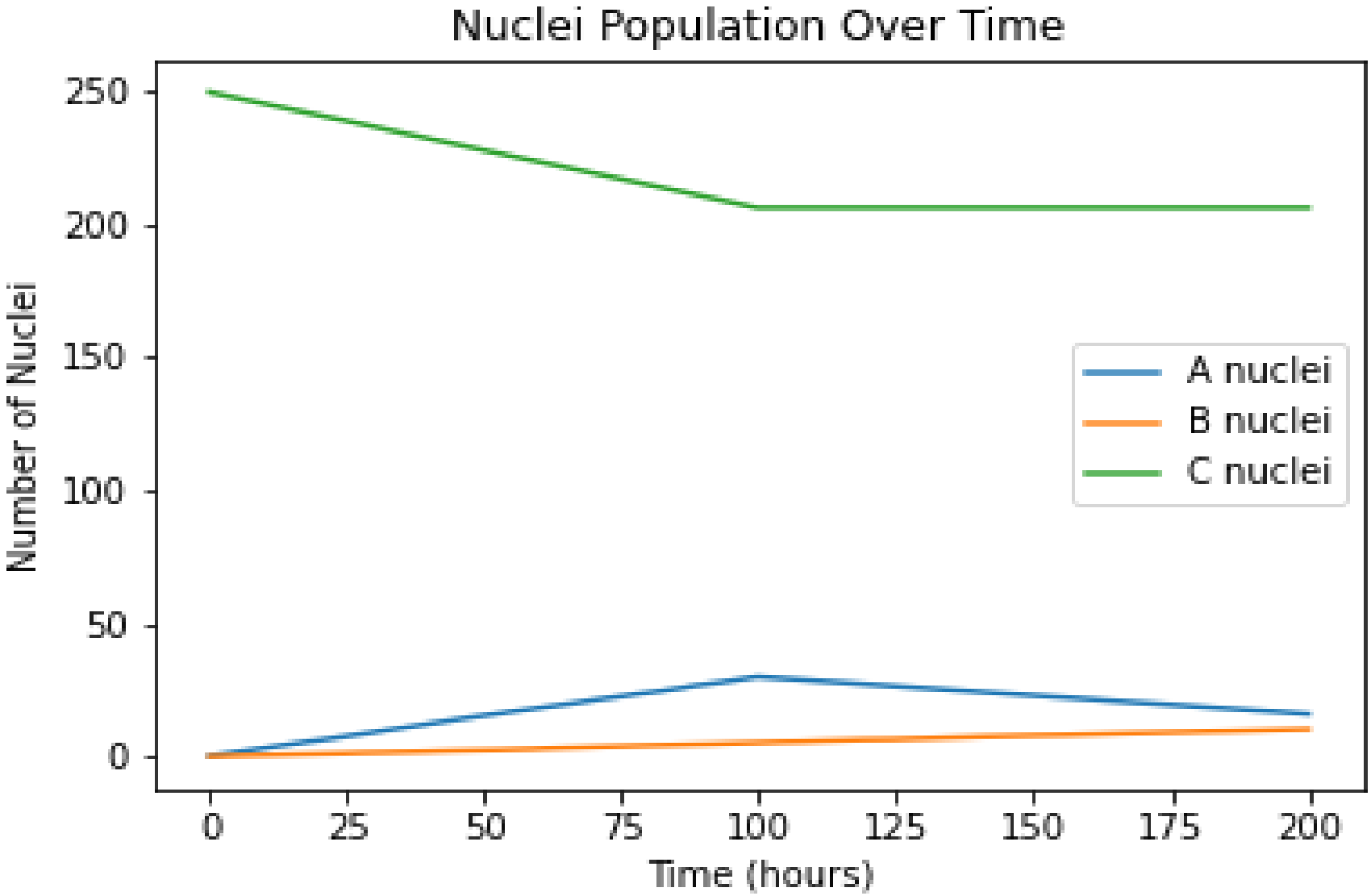

Difference between Analytical and Numerical Derivatives
dx = 0.1
dx = 0.01
dx = 0.001
Difference in derivative
0.20
0.15
0.10
0.05
0.00
−0.05
−0.10
−0.15
−0.20
0
1
2
3
4
5
6
x

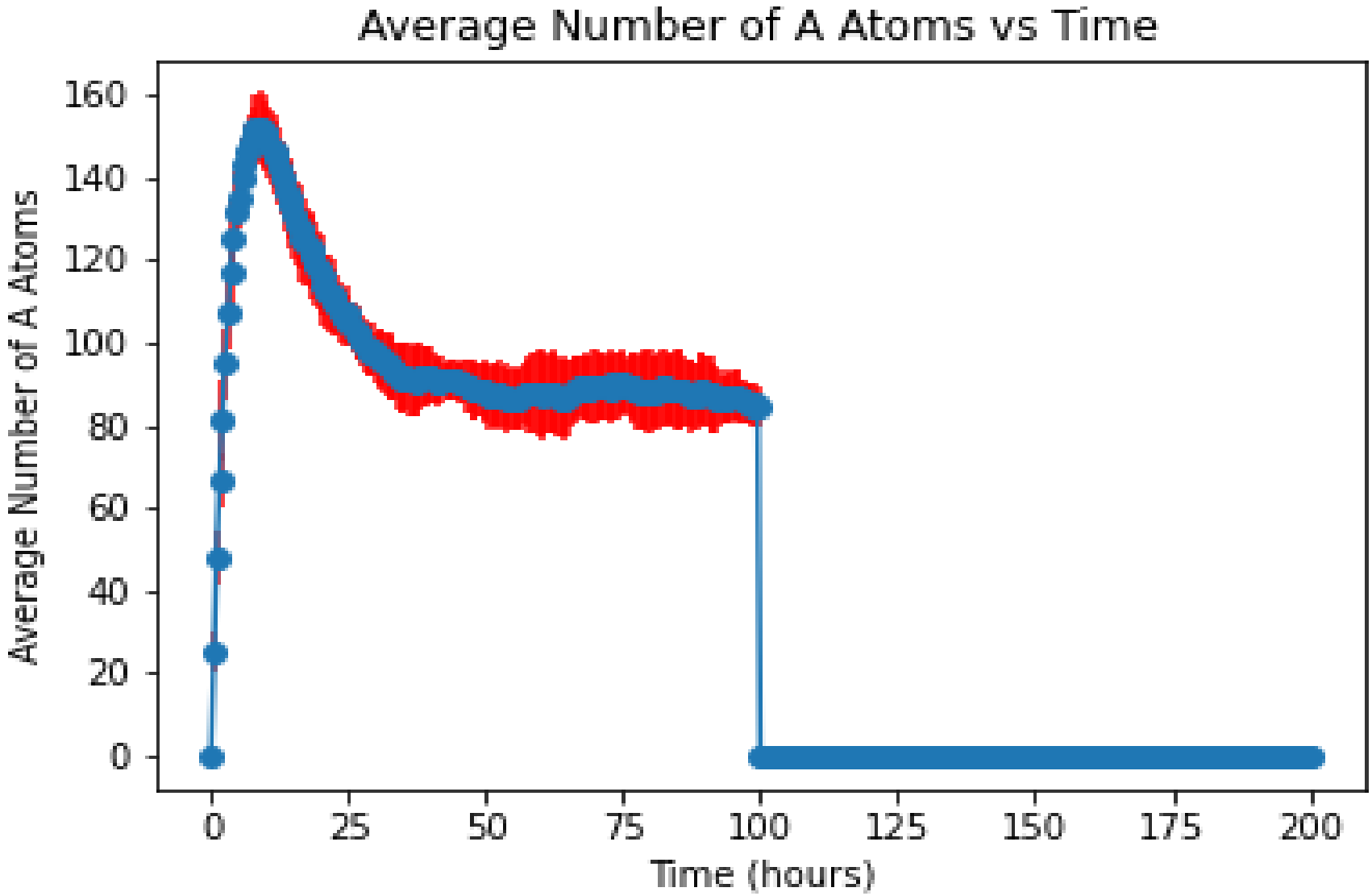

Log-log Plot of Fractional Error vs. Panel Counts
Fractional Error
3×10^0
2×10^0
10^0
10^1
10^2
10^3
Number of Panels

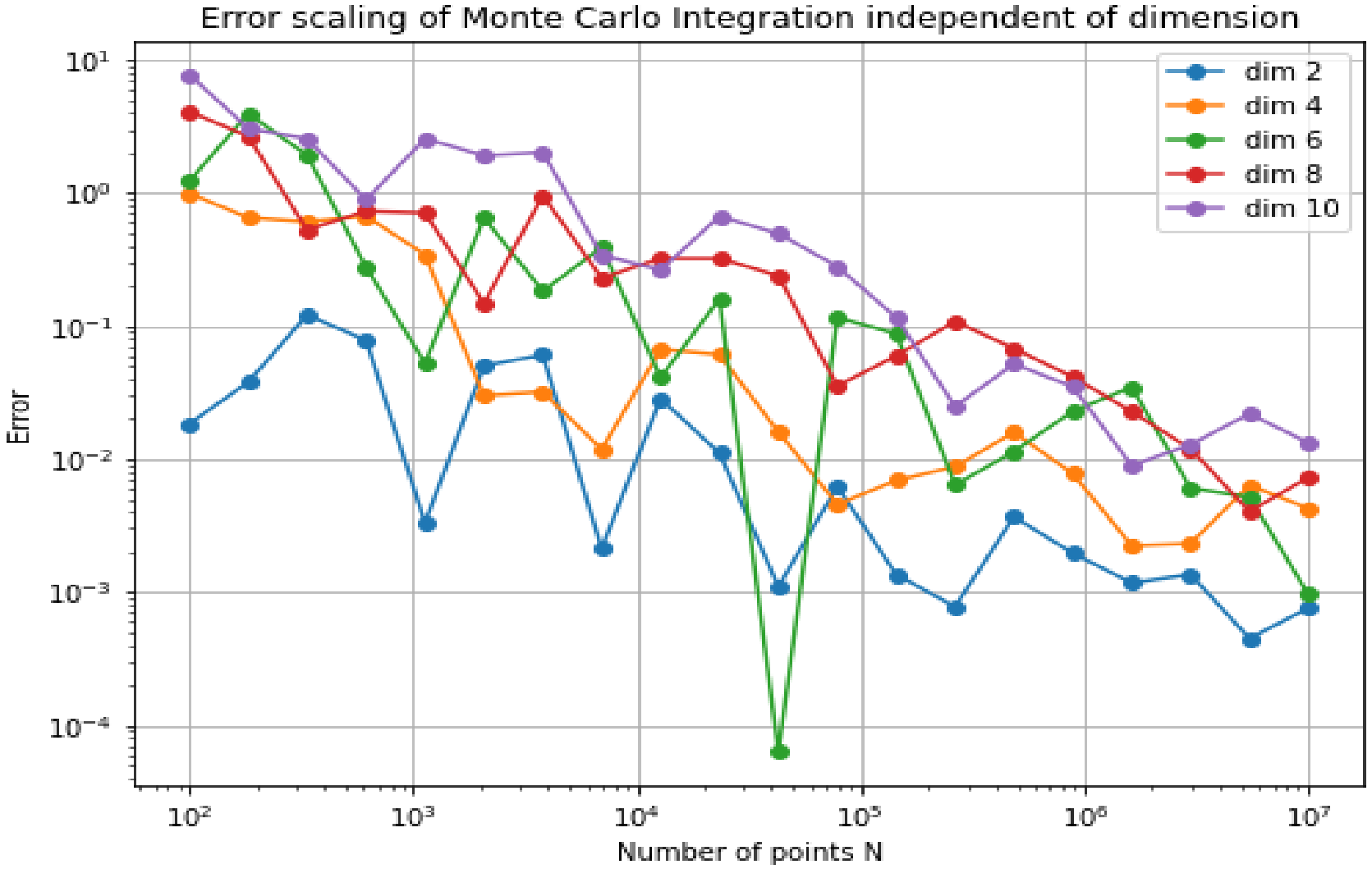

Error Comparison between Euler and RK4 methods
Euler
RK4
Error (Infinity norm)
10^{1}
10^{-1}
10^{-3}
10^{-5}
10^{-7}
10^{-9}
10^{1}
10^{2}
10^{3}
Number of time steps

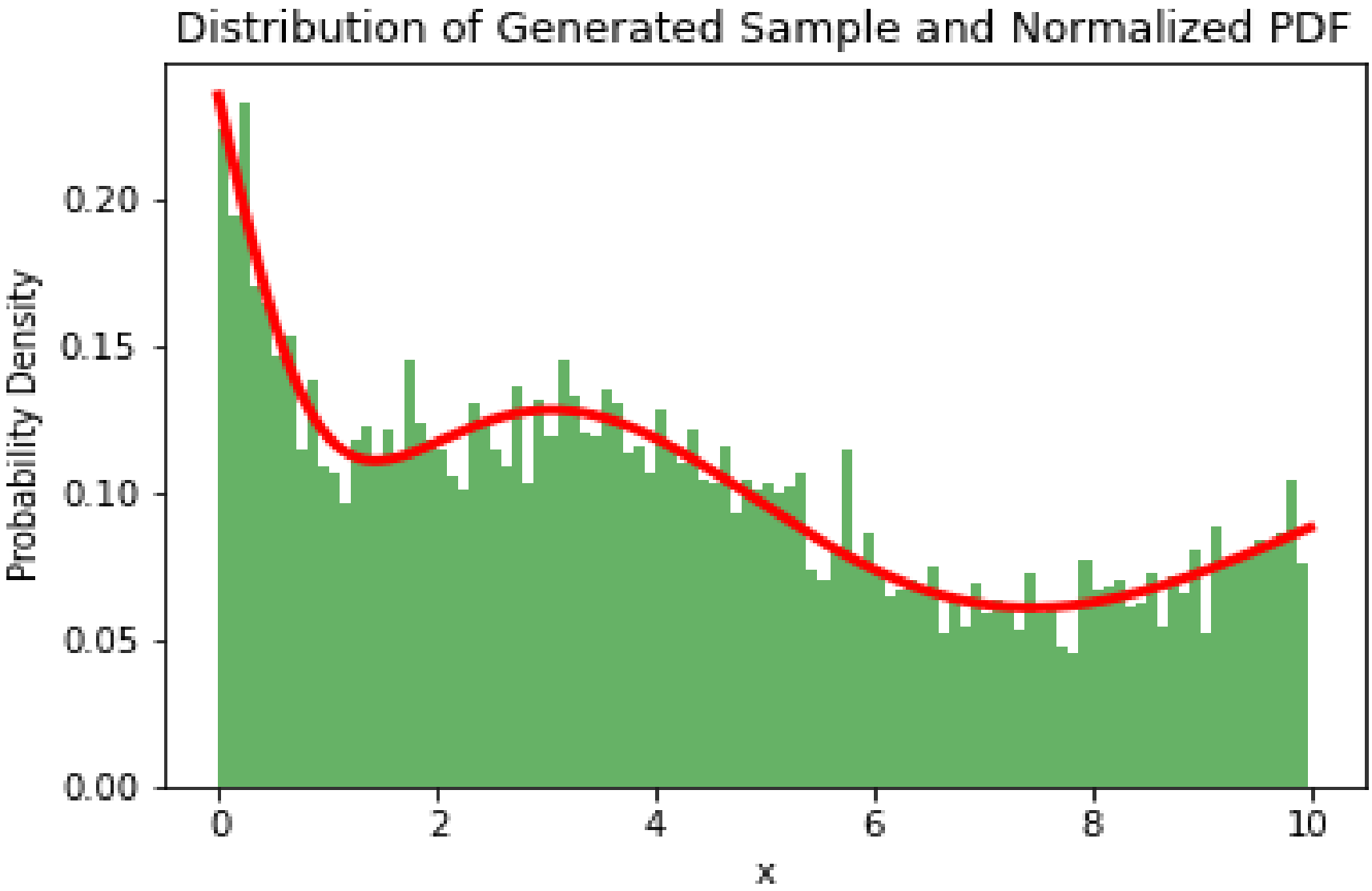

Trajectories of a Cannonball for Various Initial Angles
Height (m)
Distance (m)
0
100
200
300
400
500
0
200
400
600
800
1000
20 degrees
25 degrees
30 degrees
35 degrees
40 degrees
45 degrees
50 degrees
55 degrees
60 degrees
65 degrees

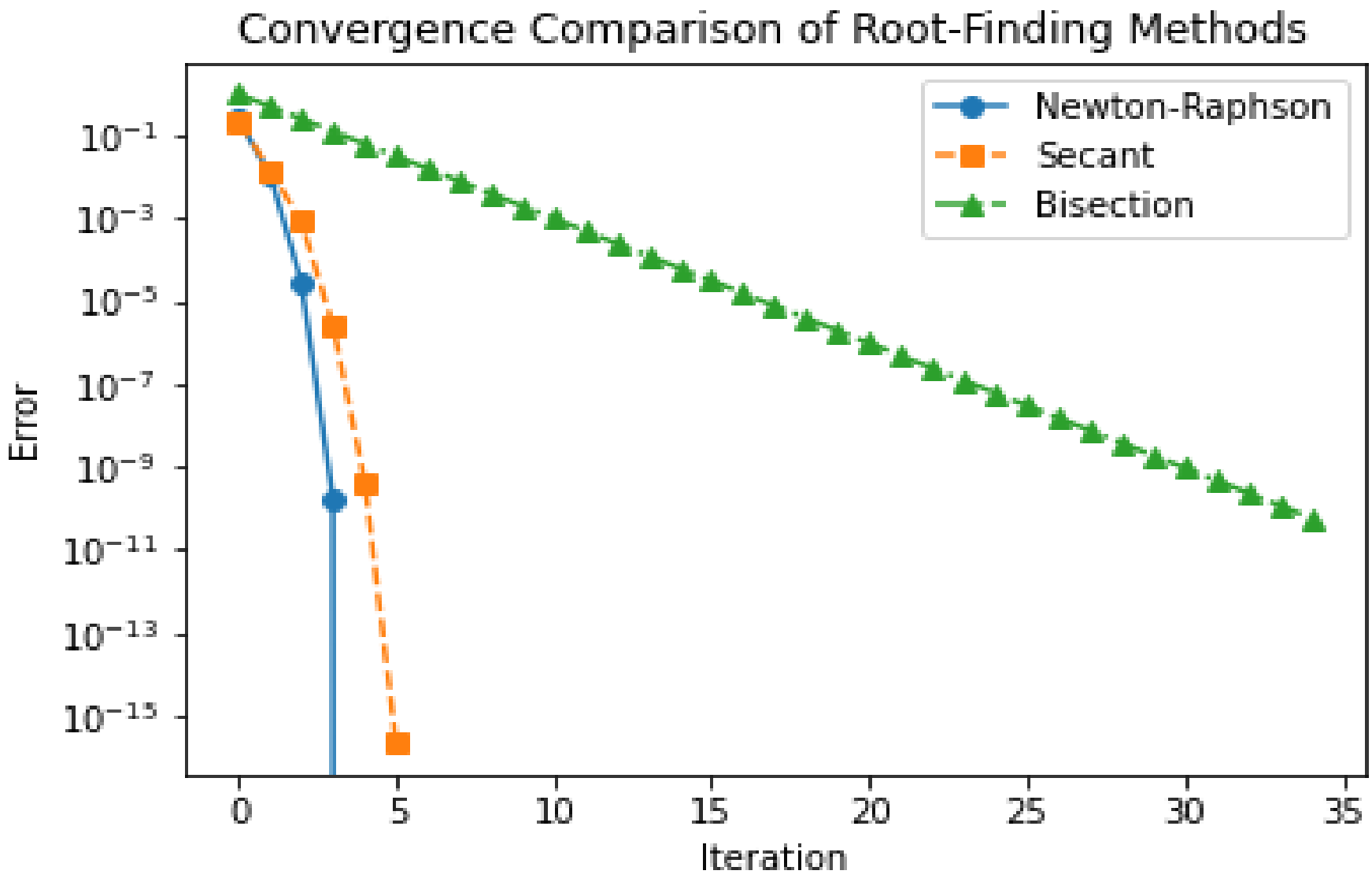

Cannonball Range vs Initial Velocity
With Air Resistance
Without Air Resistance
Range (m)
Initial Velocity (m/s)
500
1000
1500
2000
2500
3000
3500
60
80
100
120
140
160
180
200

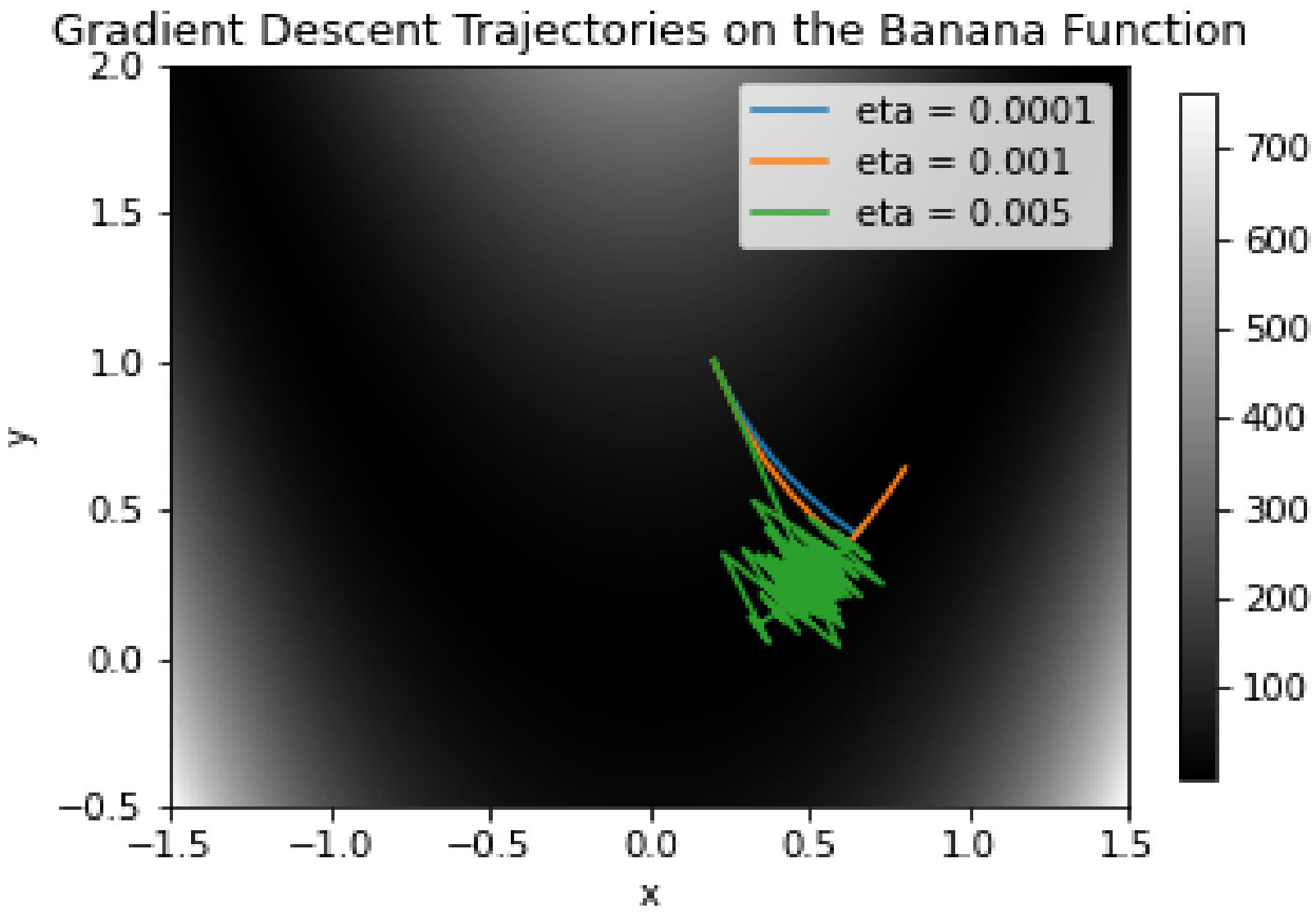

Nuclei Population Over Time
Number of Nuclei
250
200
150
100
50
0
0
25
50
75
100
125
150
175
200
Time (hours)
A nuclei
B nuclei
C nuclei

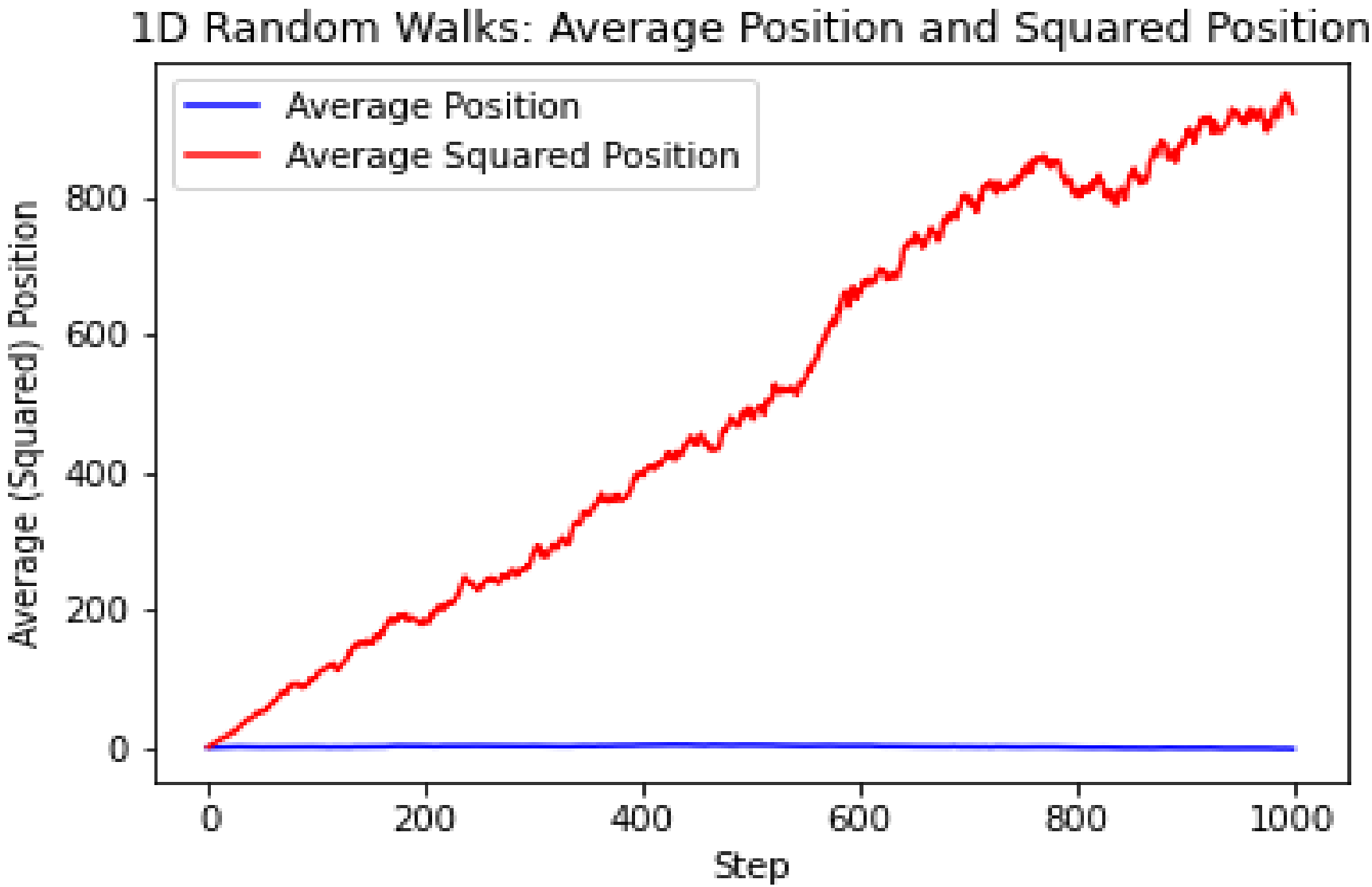

Average Number of A Atoms vs Time
Average Number of A Atoms
160
140
120
100
80
60
40
20
0
0
25
50
75
100
125
150
175
200
Time (hours)

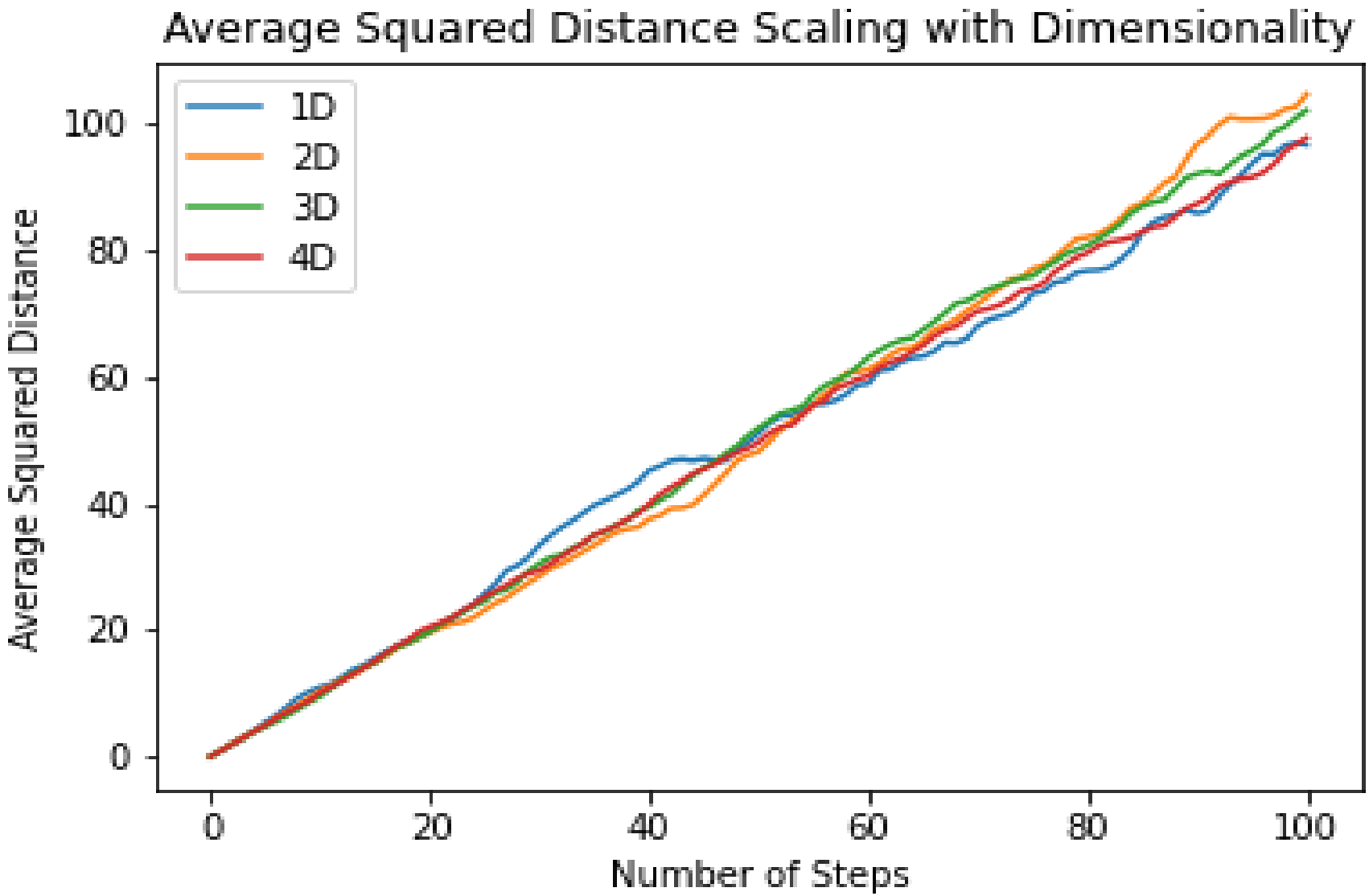

Error scaling of Monte Carlo Integration independent of dimension
dim 2
dim 4
dim 6
dim 8
dim 10
Error
Number of points N
10^{1}
10^{0}
10^{-1}
10^{-2}
10^{-3}
10^{-4}
10^{2}
10^{3}
10^{4}
10^{5}
10^{6}
10^{7}

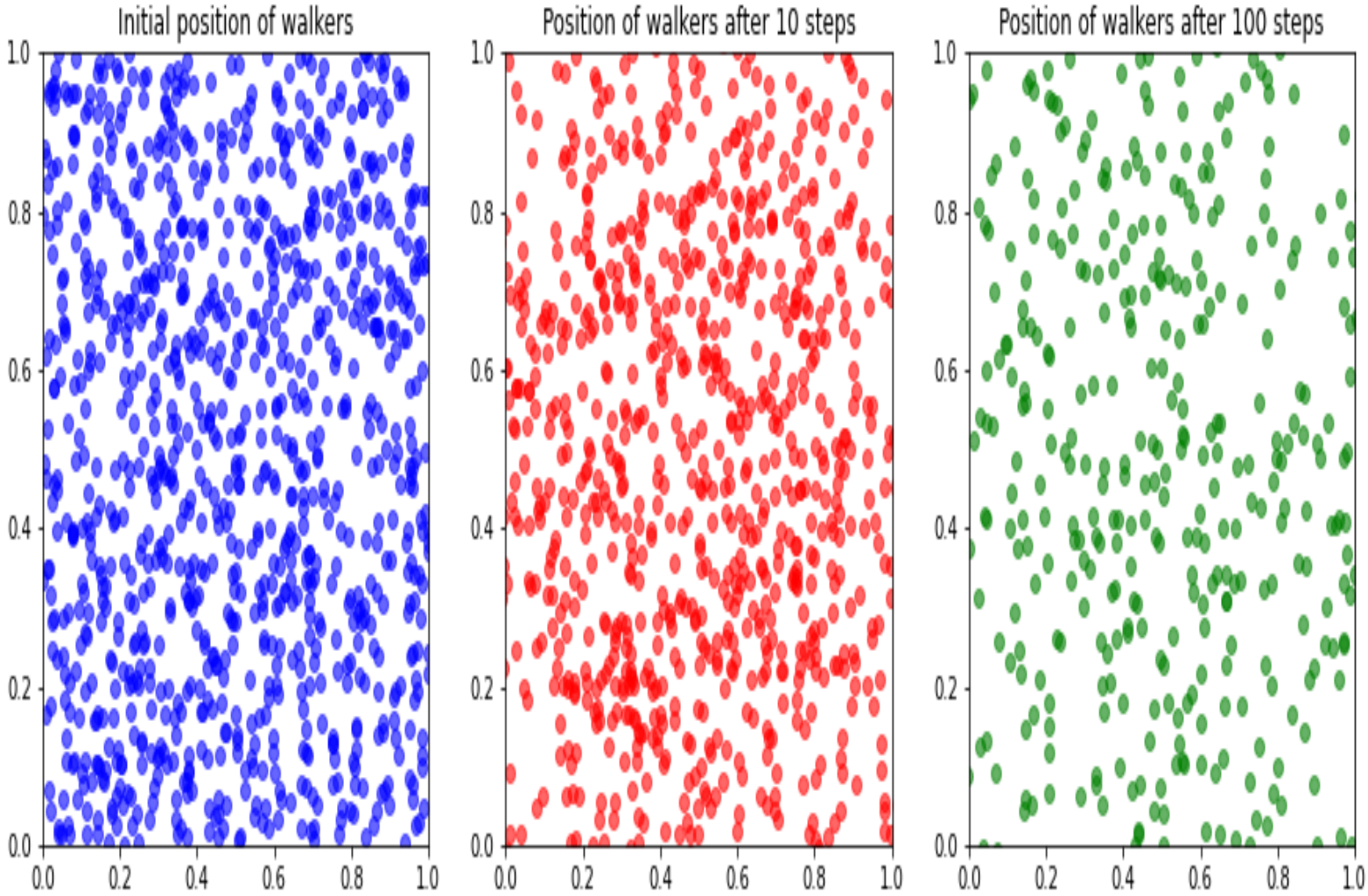

Distribution of Generated Sample and Normalized PDF
Probability Density
0.00
0.05
0.10
0.15
0.20
0
2
4
6
8
10
x


Convergence Comparison of Root-Finding Methods
Newton-Raphson
Secant
Bisection
Error
10^{-1}
10^{-3}
10^{-5}
10^{-7}
10^{-9}
10^{-11}
10^{-13}
10^{-15}
0
5
10
15
20
25
30
35
Iteration


Gradient Descent Trajectories on the Banana Function
eta = 0.0001
eta = 0.001
eta = 0.005
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
700
600
500
400
300
200
100


1D Random Walks: Average Position and Squared Position
Average Position
Average Squared Position
Average (Squared) Position
0
200
400
600
800
0
200
400
600
800
1000
Step


Average Squared Distance Scaling with Dimensionality
1D
2D
3D
4D
Average Squared Distance
0
20
40
60
80
100
Number of Steps


Initial position of walkers
Position of walkers after 10 steps
Position of walkers after 100 steps
0.0
0.2
0.4
0.6
0.8
1.0

AI?