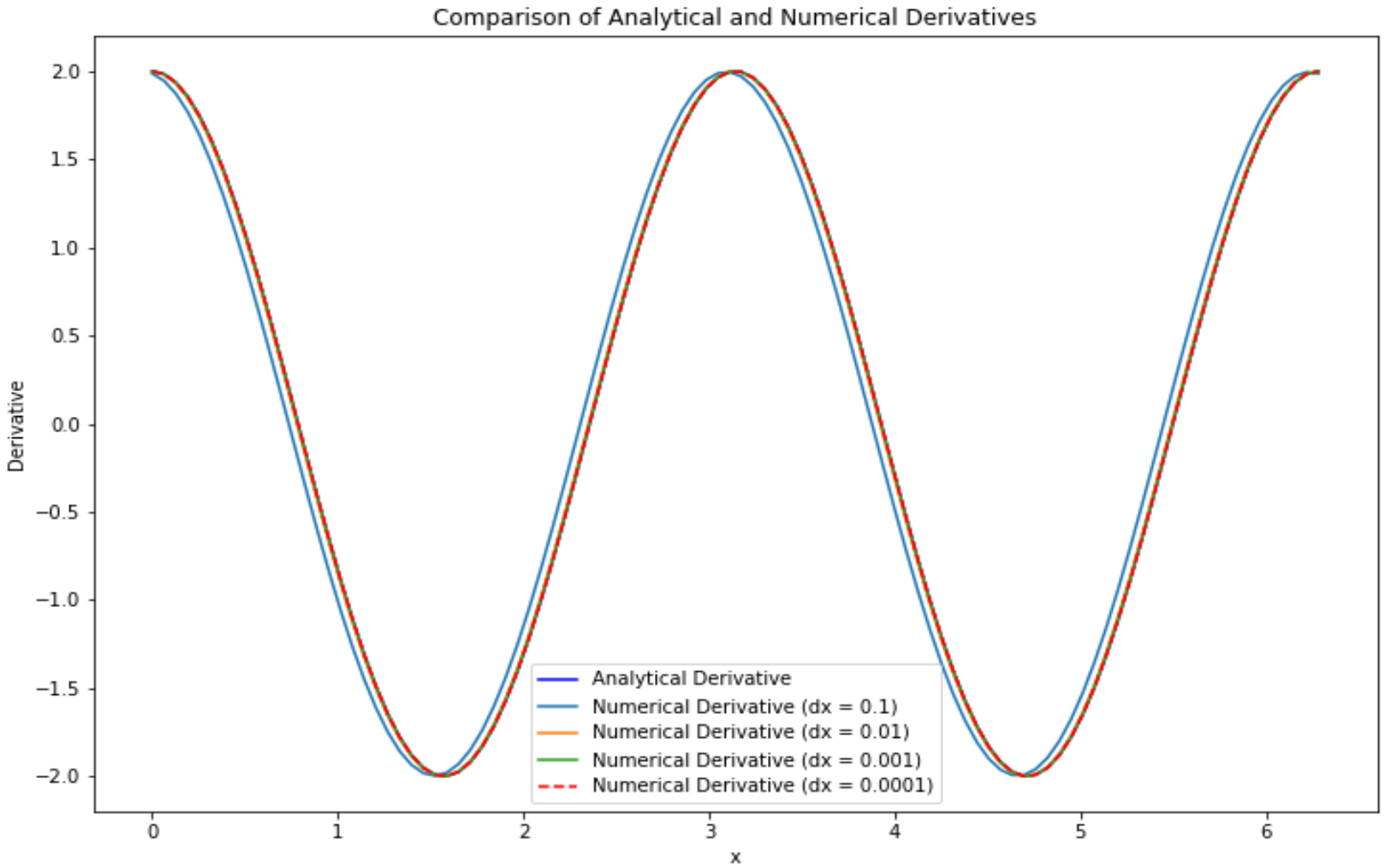
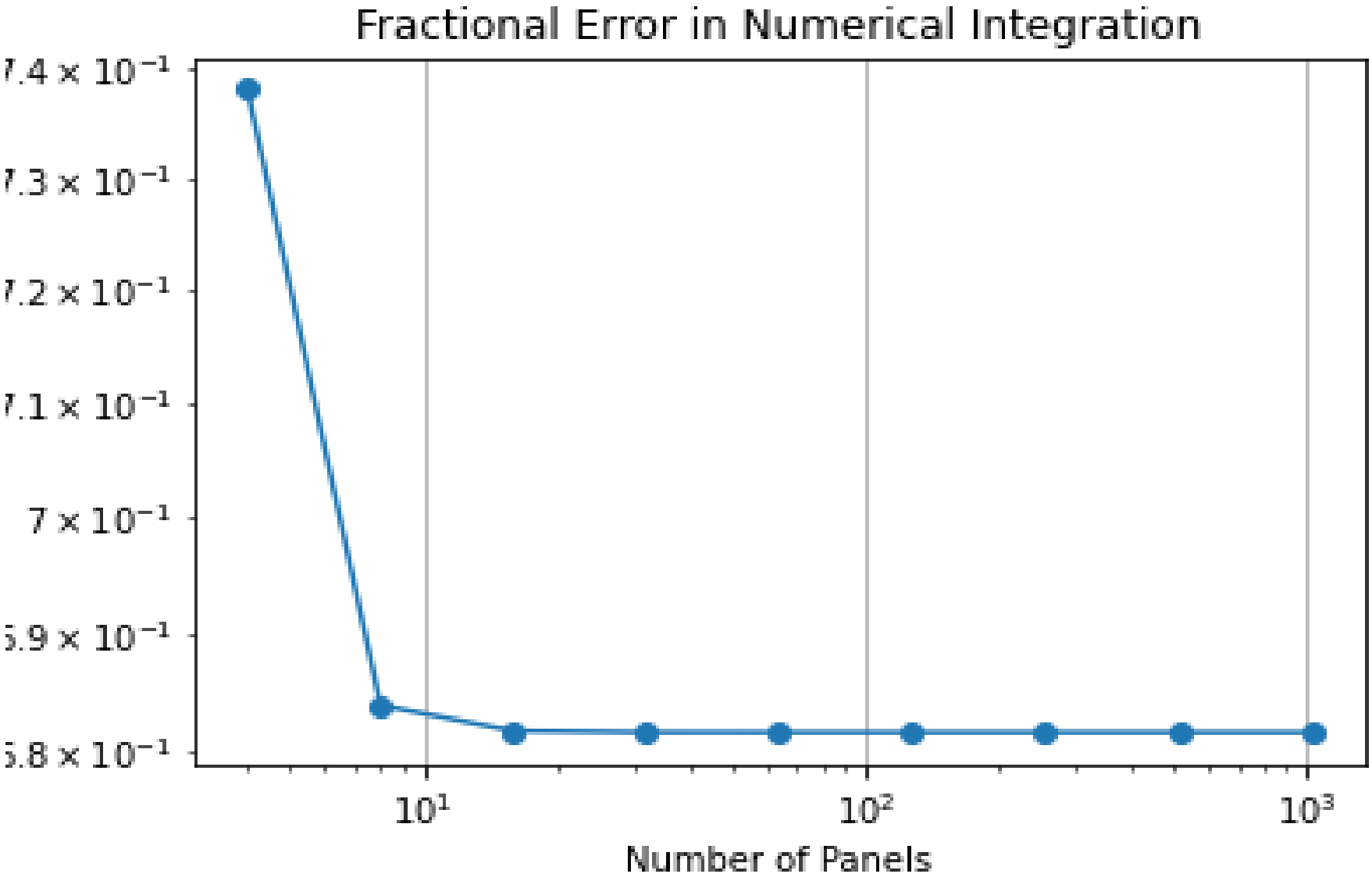
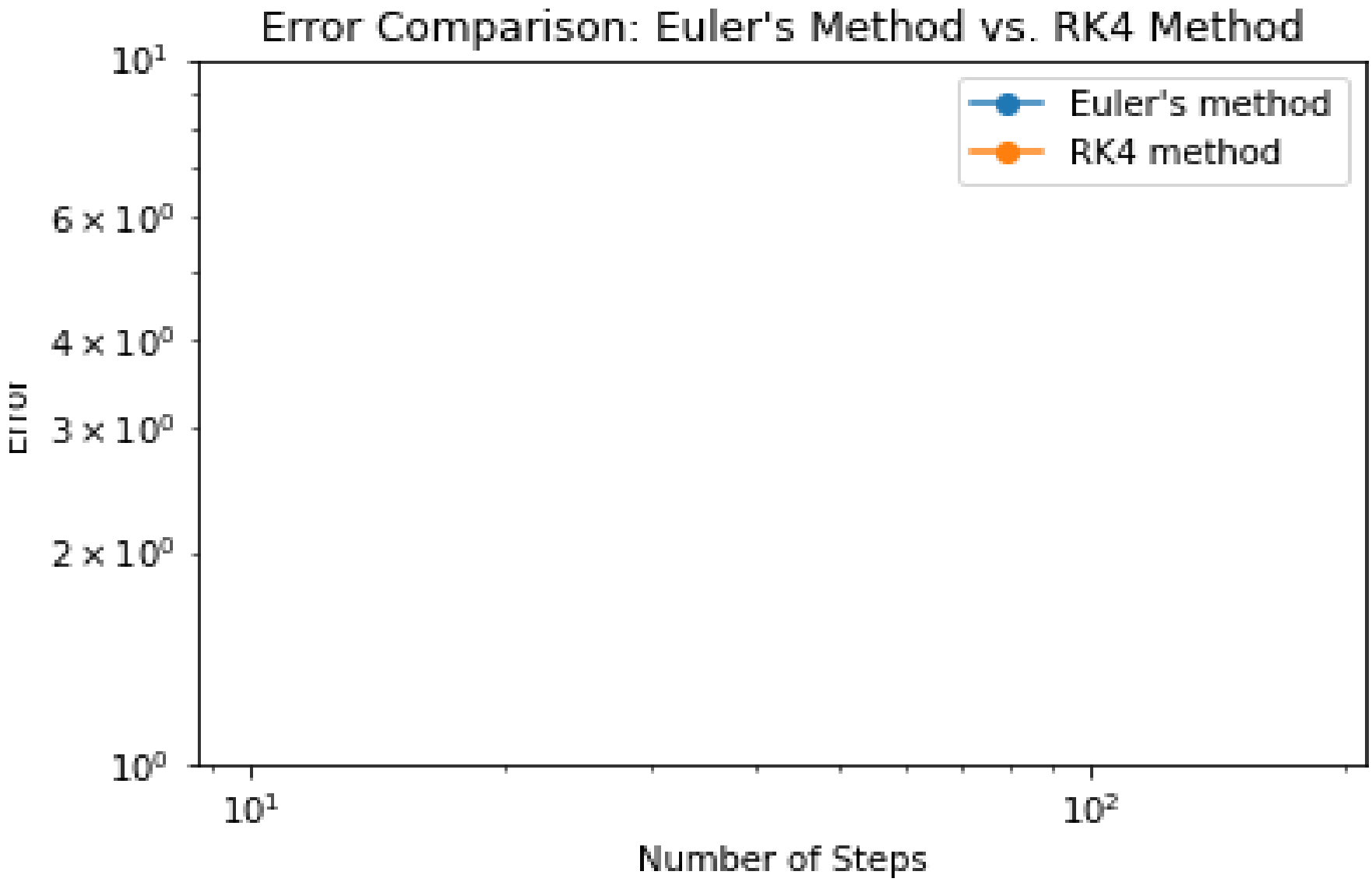
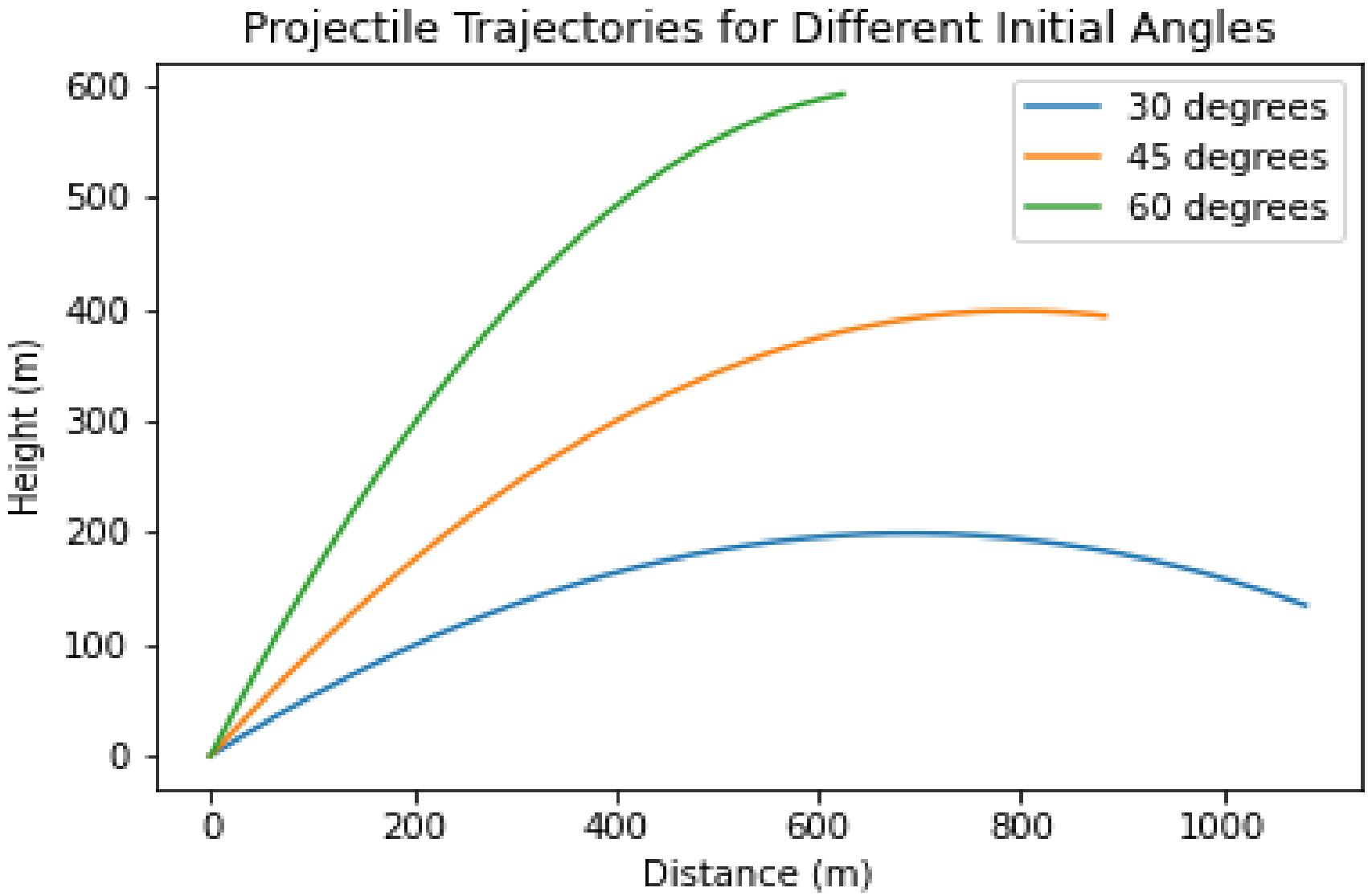
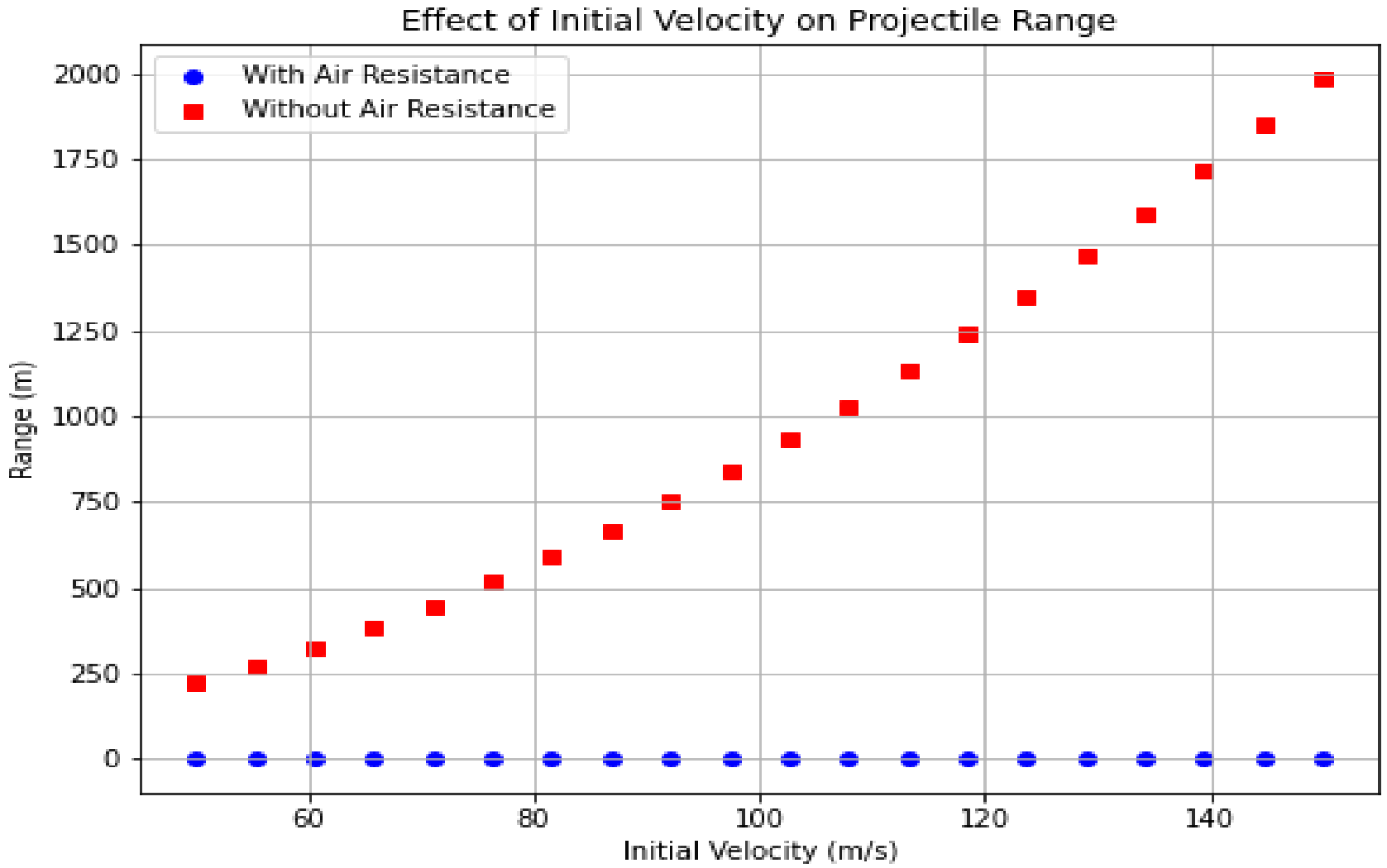
52506

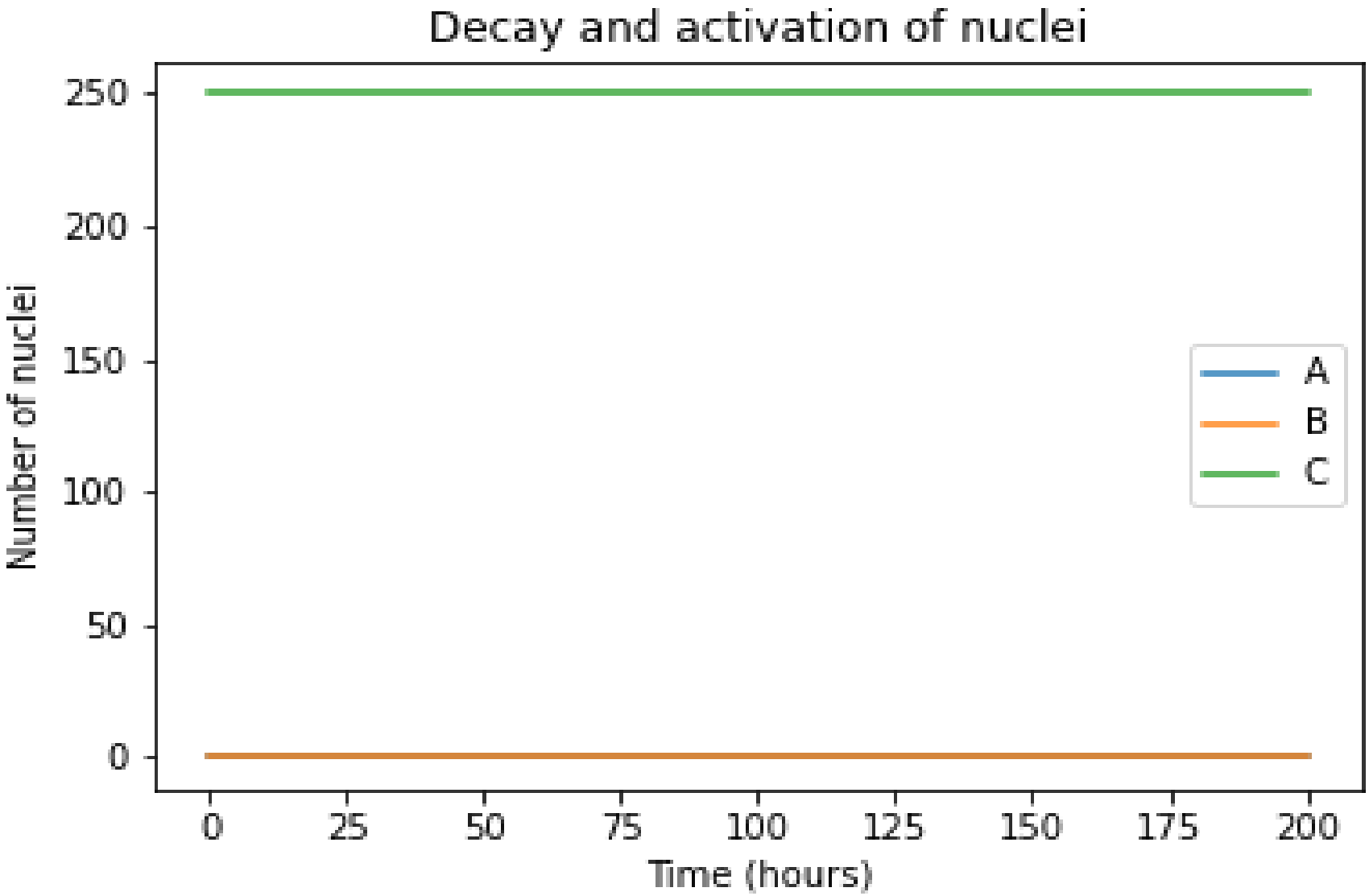

Comparison of Analytical and Numerical Derivatives
Derivative
x
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
0
1
2
3
4
5
6
Analytical Derivative
Numerical Derivative (dx = 0.1)
Numerical Derivative (dx = 0.01)
Numerical Derivative (dx = 0.001)
Numerical Derivative (dx = 0.0001)

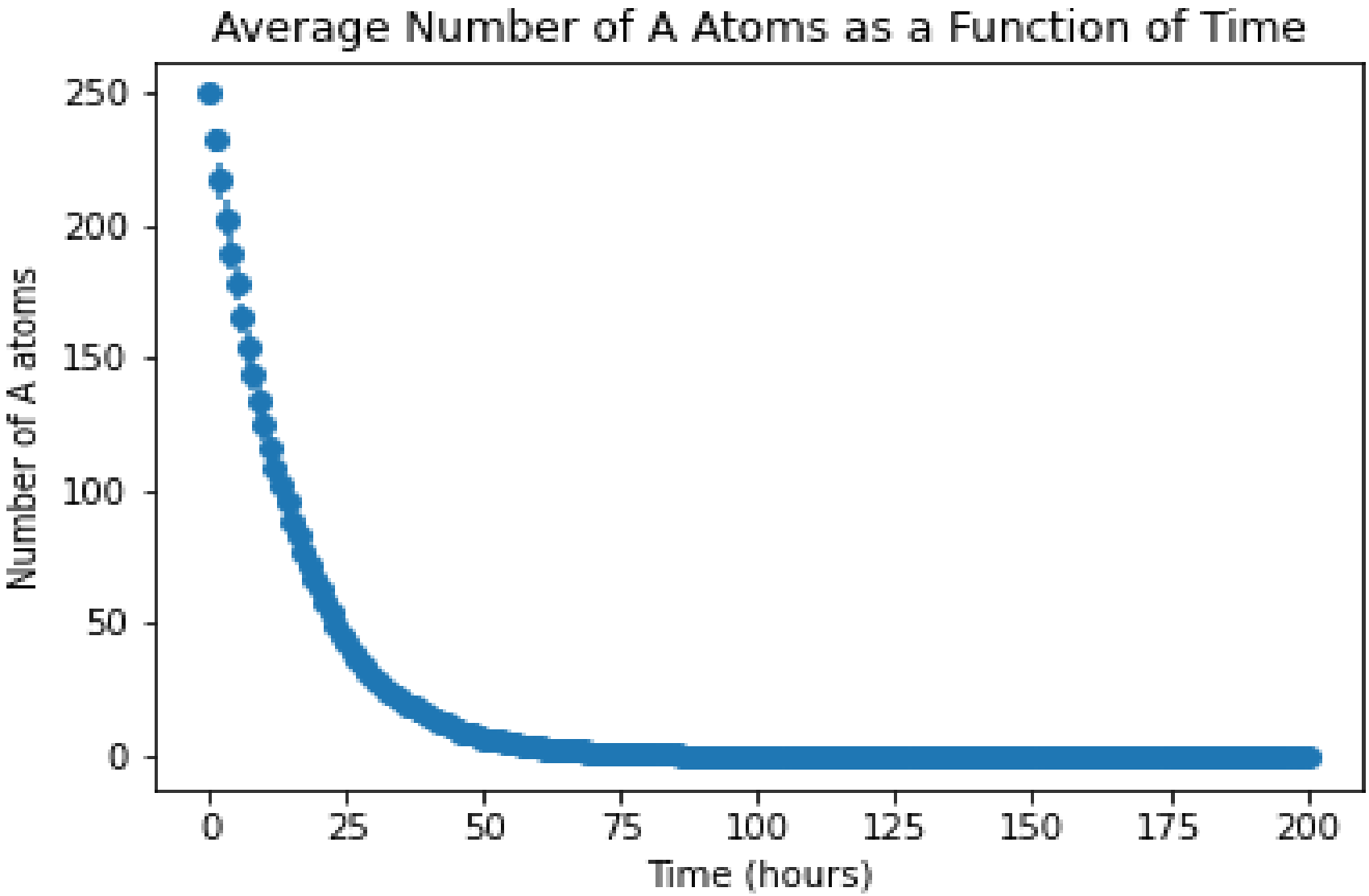

Fractional Error in Numerical Integration
7.4 x 10⁻¹
7.3 x 10⁻¹
7.2 x 10⁻¹
7.1 x 10⁻¹
7 x 10⁻¹
6.9 x 10⁻¹
6.8 x 10⁻¹
10¹
10²
10³
Number of Panels

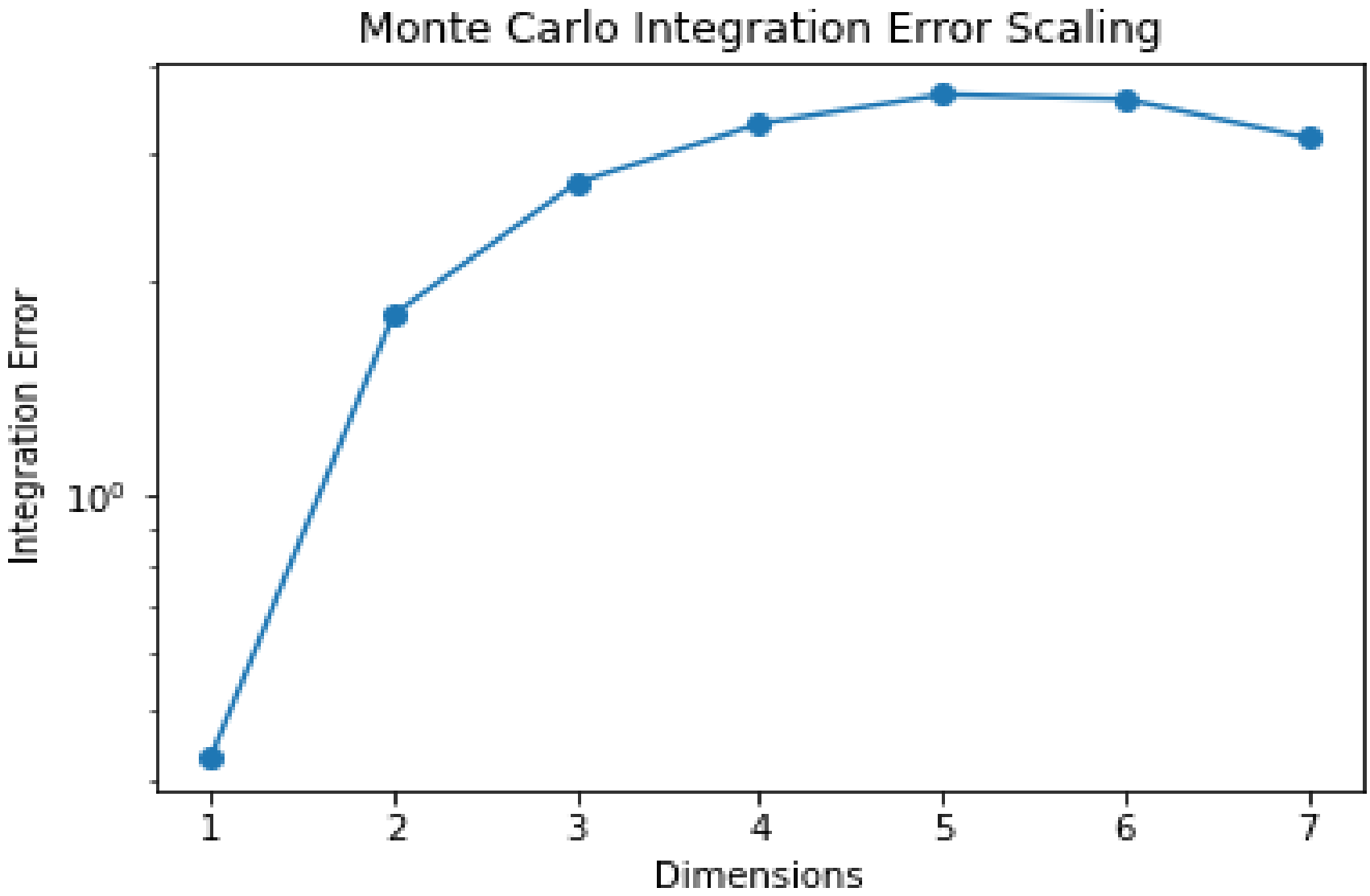

Error Comparison: Euler's Method vs. RK4 Method
Euler's method
RK4 method
10^1
6×10^0
4×10^0
3×10^0
2×10^0
10^0
Error
10^1
10^2
Number of Steps

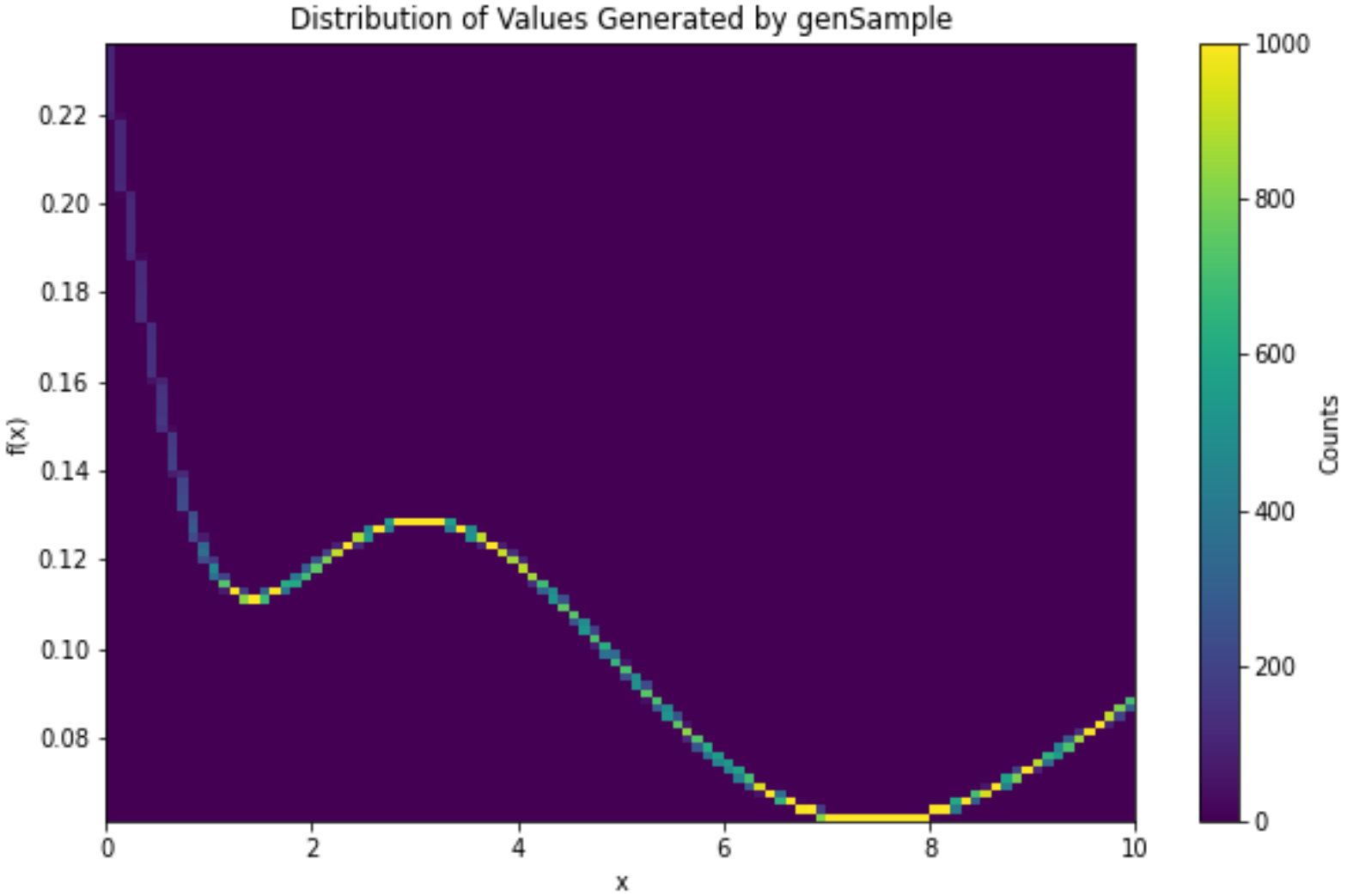

Projectile Trajectories for Different Initial Angles
30 degrees
45 degrees
60 degrees
Height (m)
Distance (m)
0
100
200
300
400
500
600
0
200
400
600
800
1000

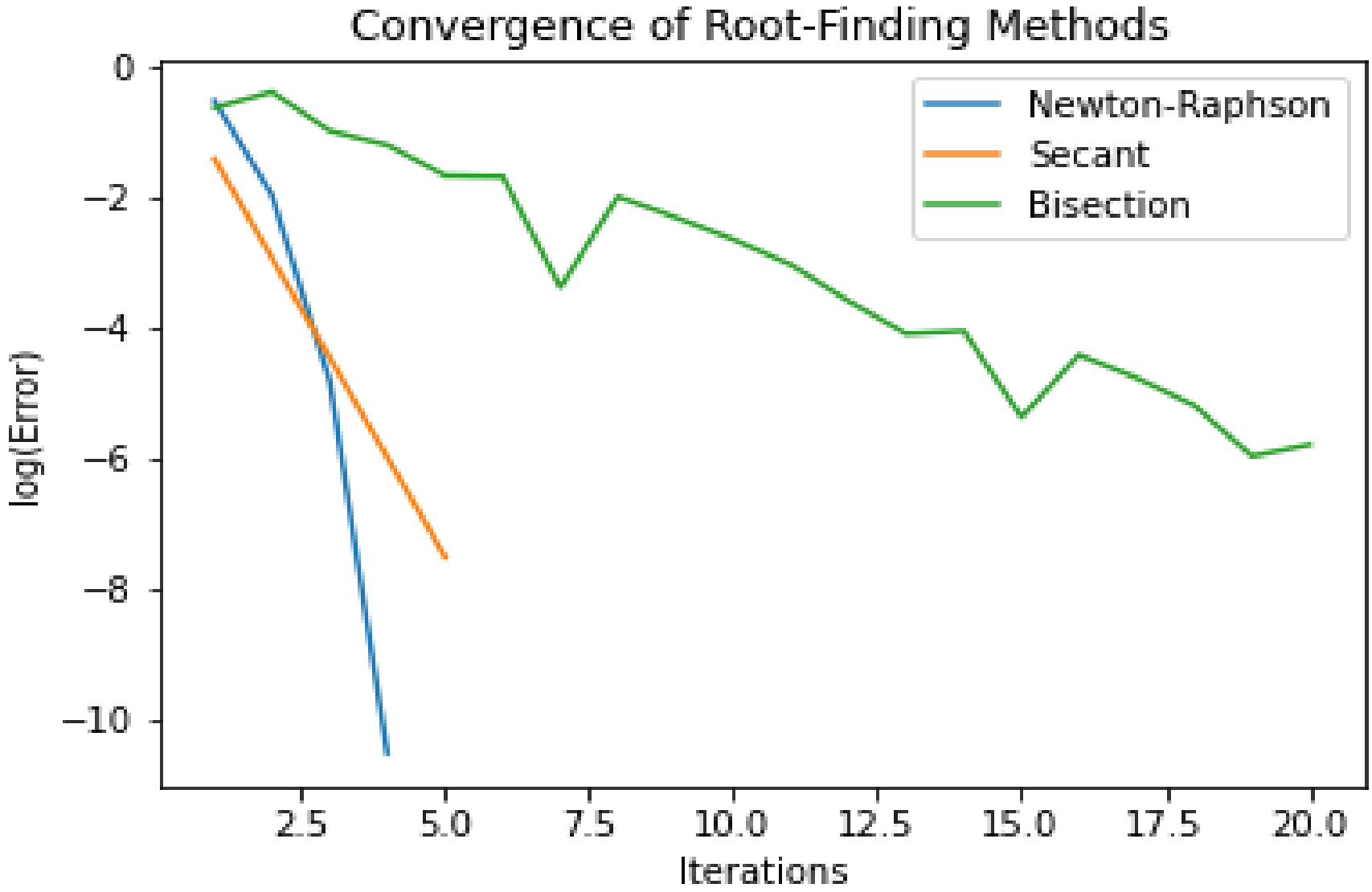

Effect of Initial Velocity on Projectile Range
With Air Resistance
Without Air Resistance
Range (m)
2000
1750
1500
1250
1000
750
500
250
0
60
80
100
120
140
Initial Velocity (m/s)

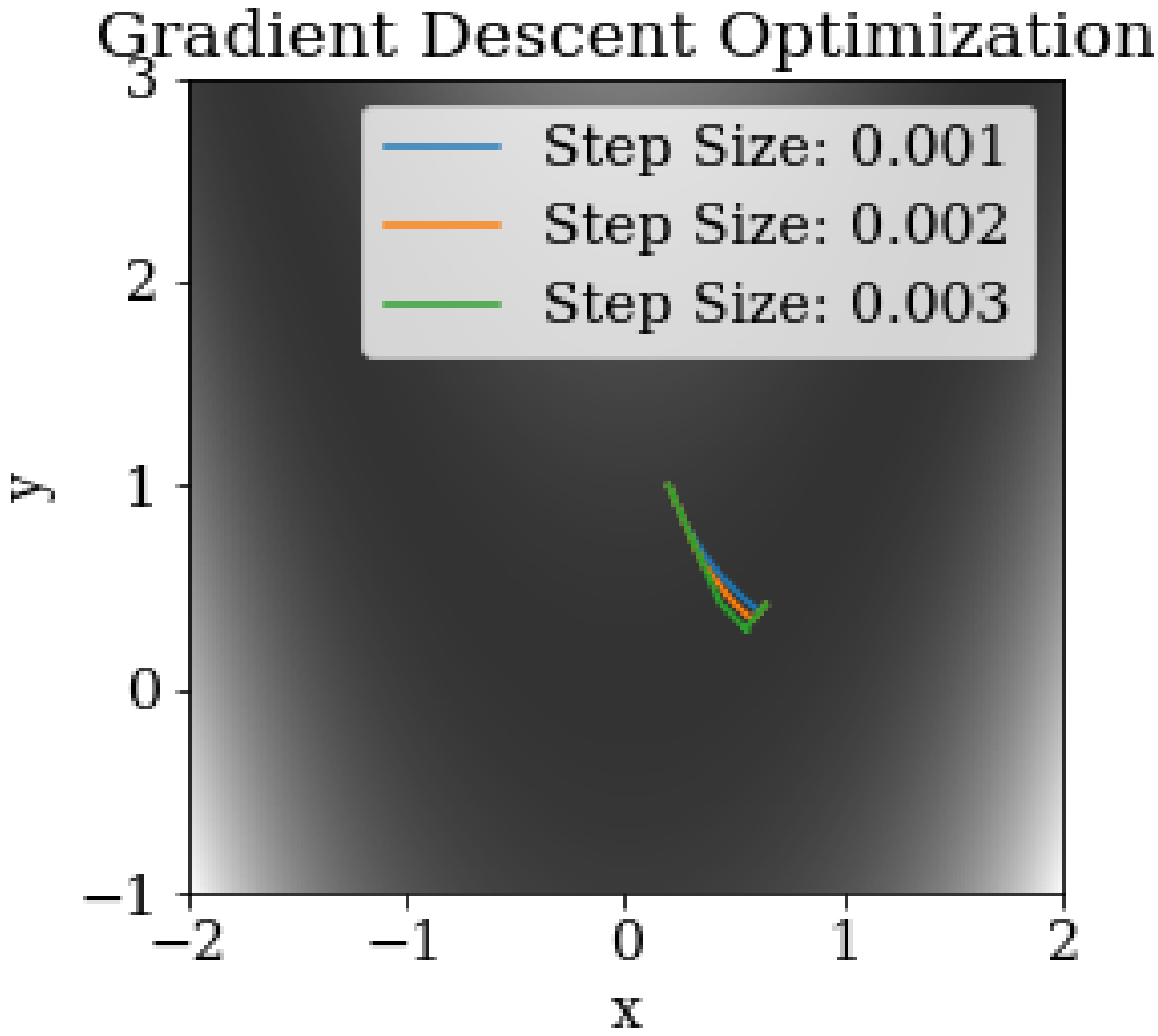

Decay and activation of nuclei
Number of nuclei
250
200
150
100
50
0
0
25
50
75
100
125
150
175
200
Time (hours)
A
B
C

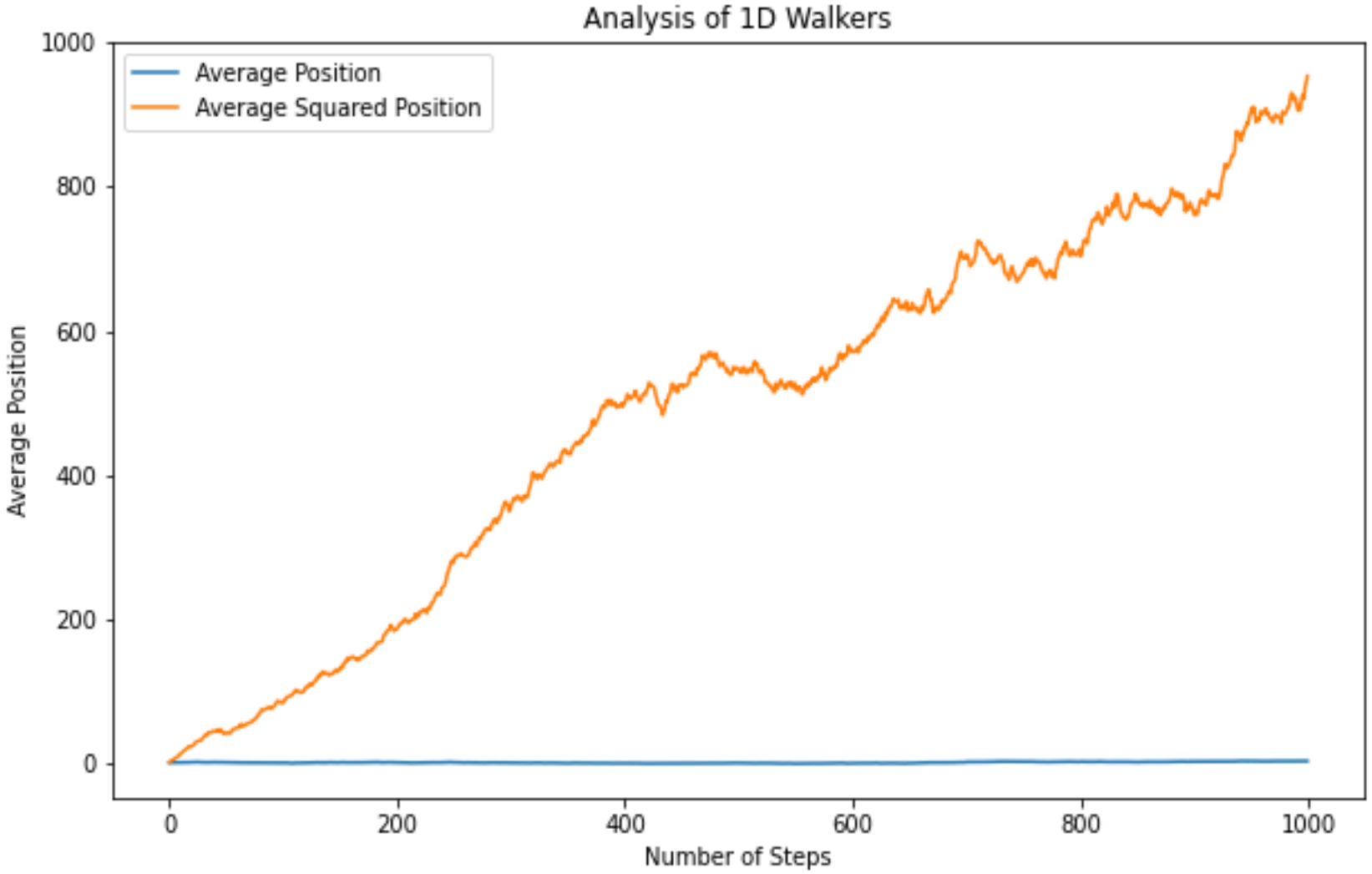

Average Number of A Atoms as a Function of Time
Number of A atoms
250
200
150
100
50
0
0
25
50
75
100
125
150
175
200
Time (hours)

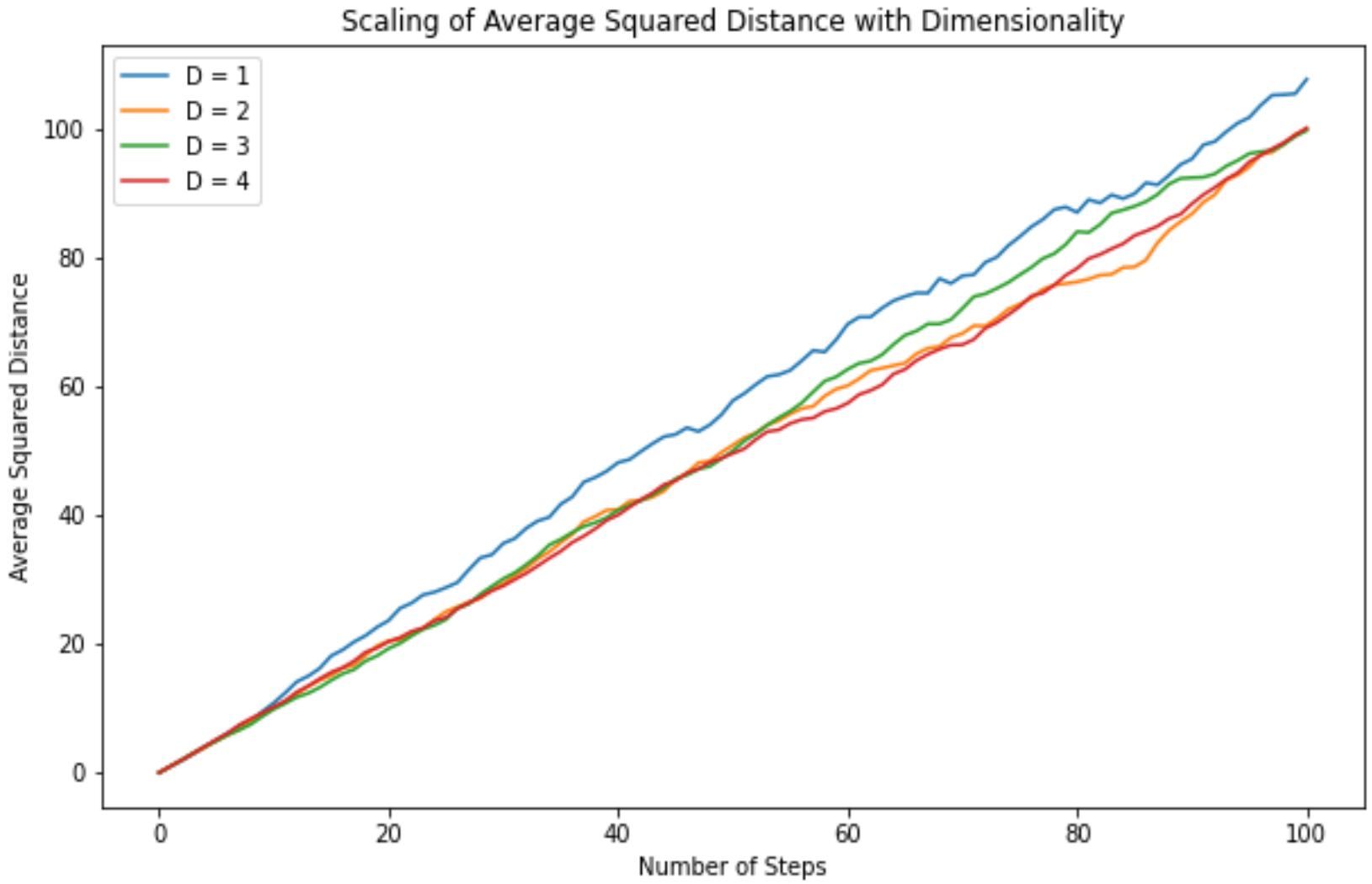

Monte Carlo Integration Error Scaling
Integration Error
10^0
1
2
3
4
5
6
7
Dimensions

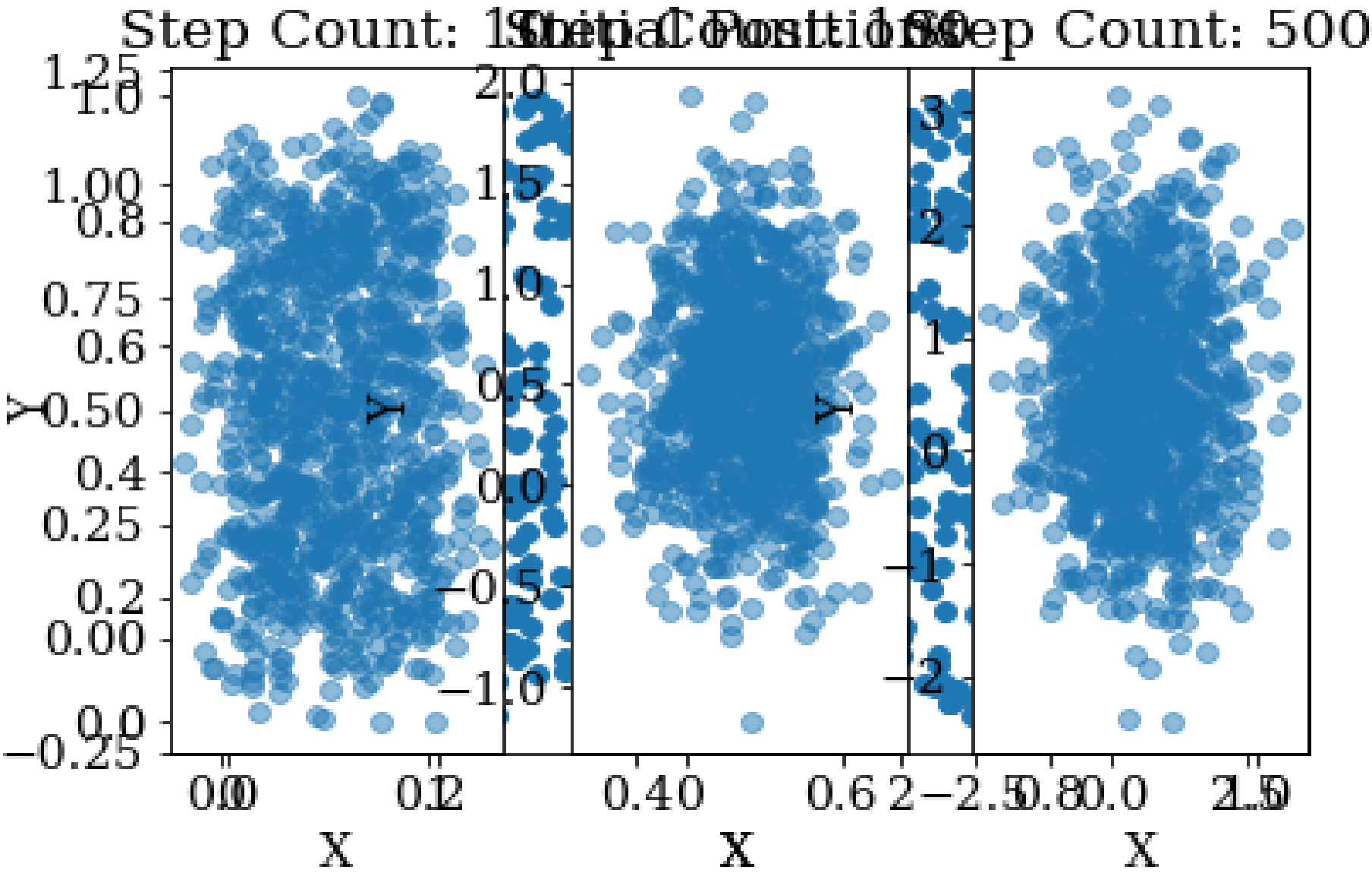

Distribution of Values Generated by genSample
f(x)
0.22
0.20
0.18
0.16
0.14
0.12
0.10
0.08
0
2
4
6
8
10
x
1000
800
600
400
200
0
Counts


Convergence of Root-Finding Methods
Newton-Raphson
Secant
Bisection
log(Error)
Iterations
0
−2
−4
−6
−8
−10
2.5
5.0
7.5
10.0
12.5
15.0
17.5
20.0


Gradient Descent Optimization
Step Size: 0.001
Step Size: 0.002
Step Size: 0.003
3
2
1
0
−1
y
−2
−1
0
1
2
x


Analysis of 1D Walkers
Average Position
Average Squared Position
Average Position
Number of Steps
0
200
400
600
800
1000


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



Step Count: 500
Y
X

AI?