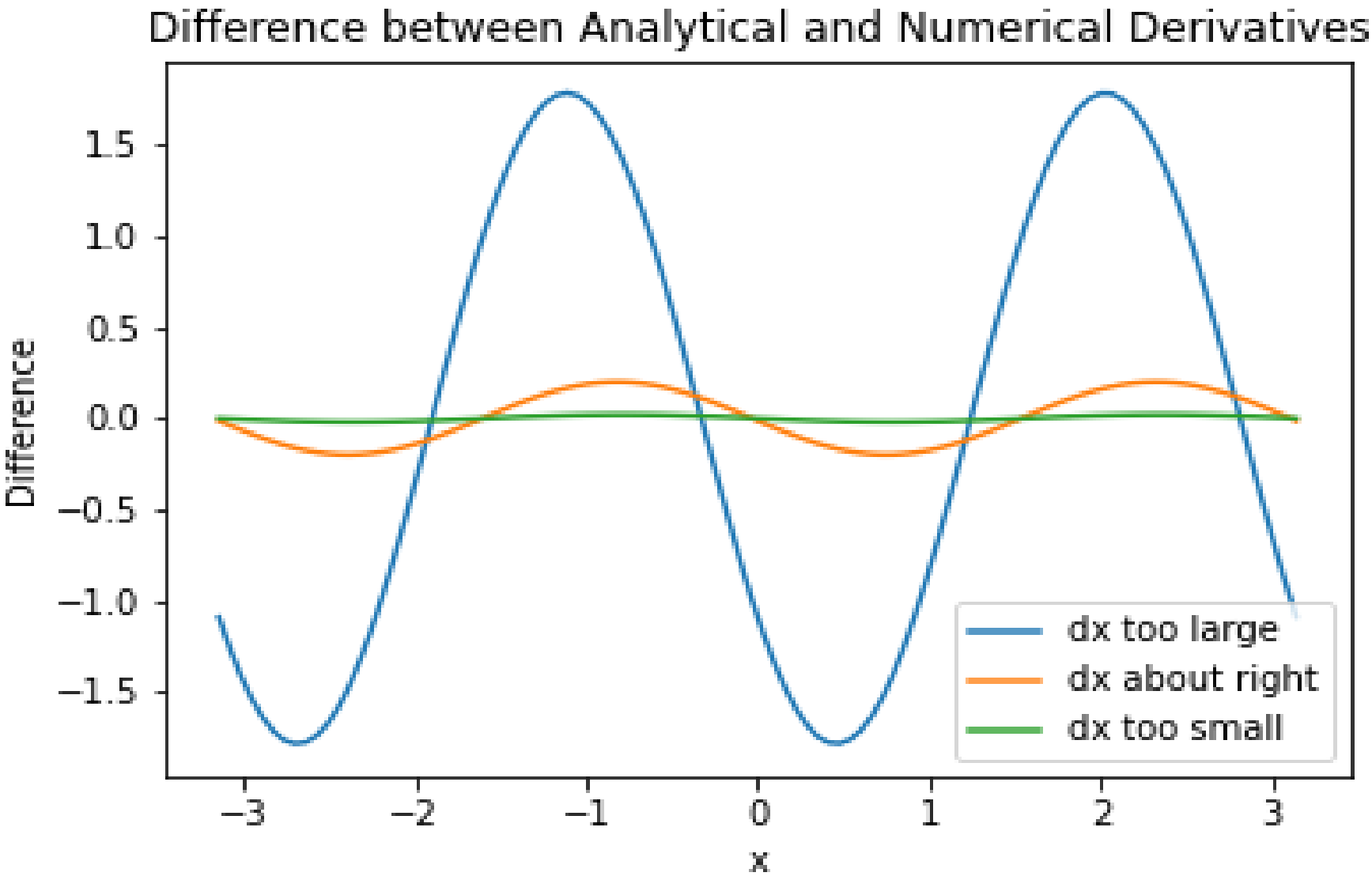
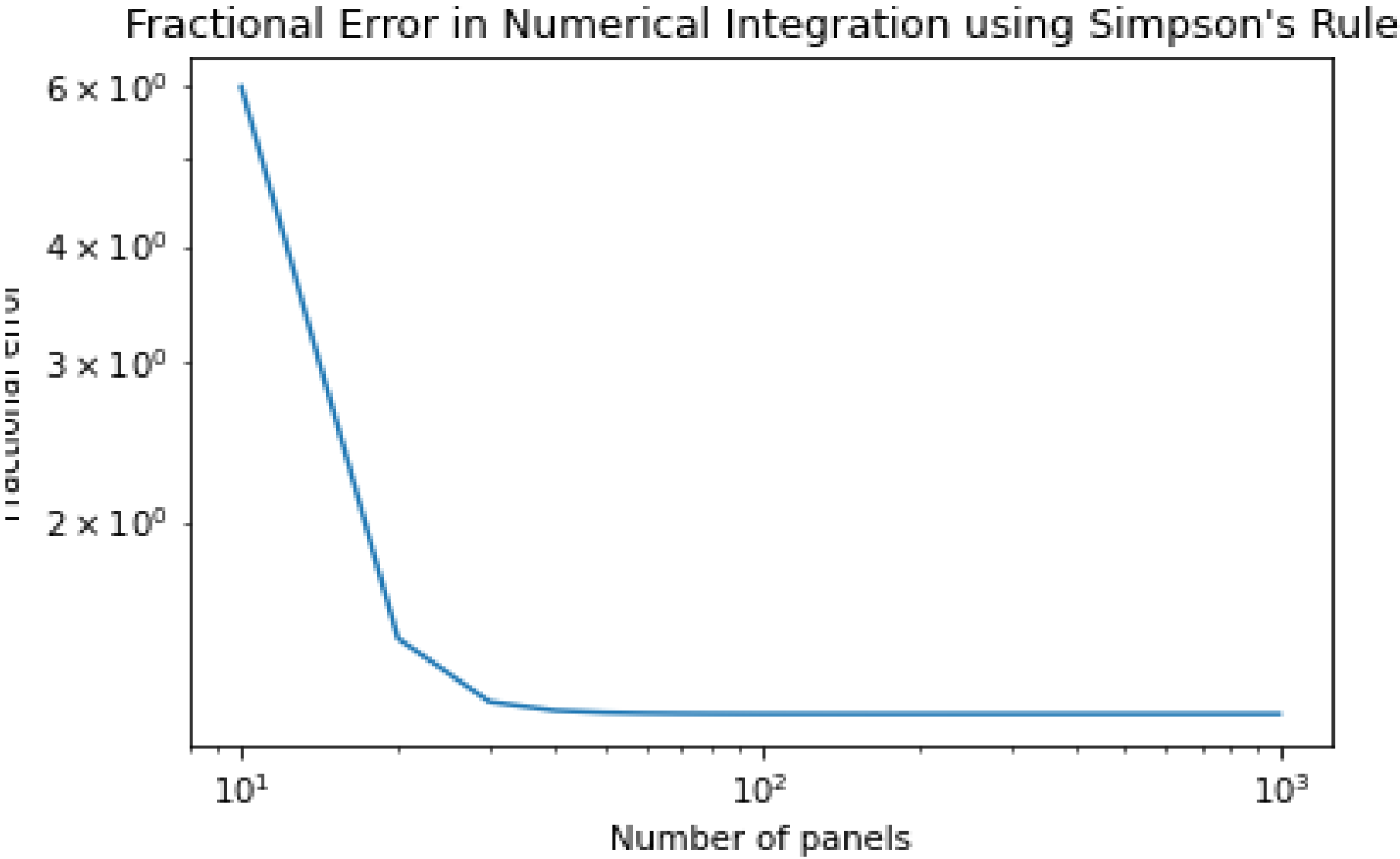
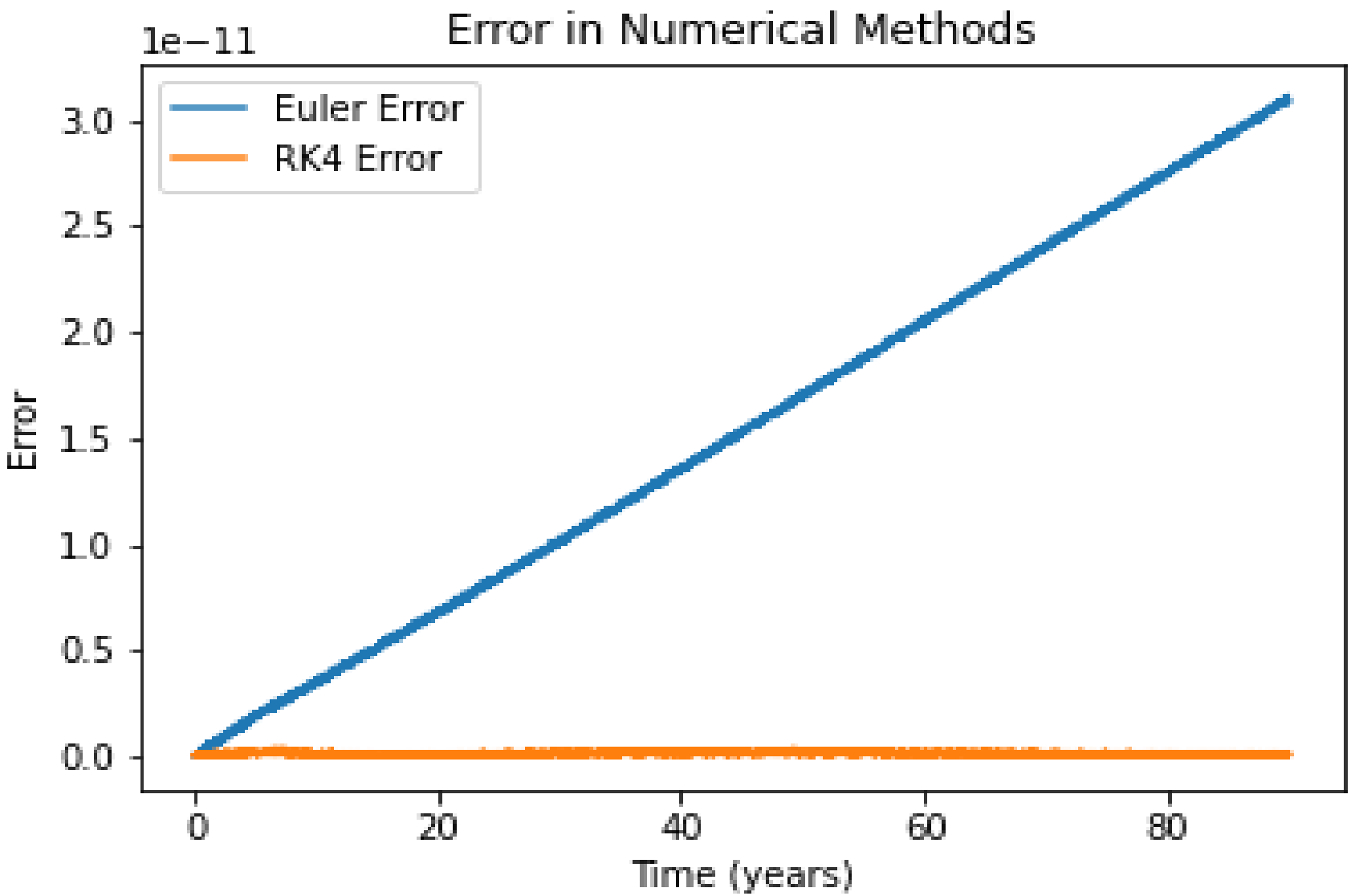
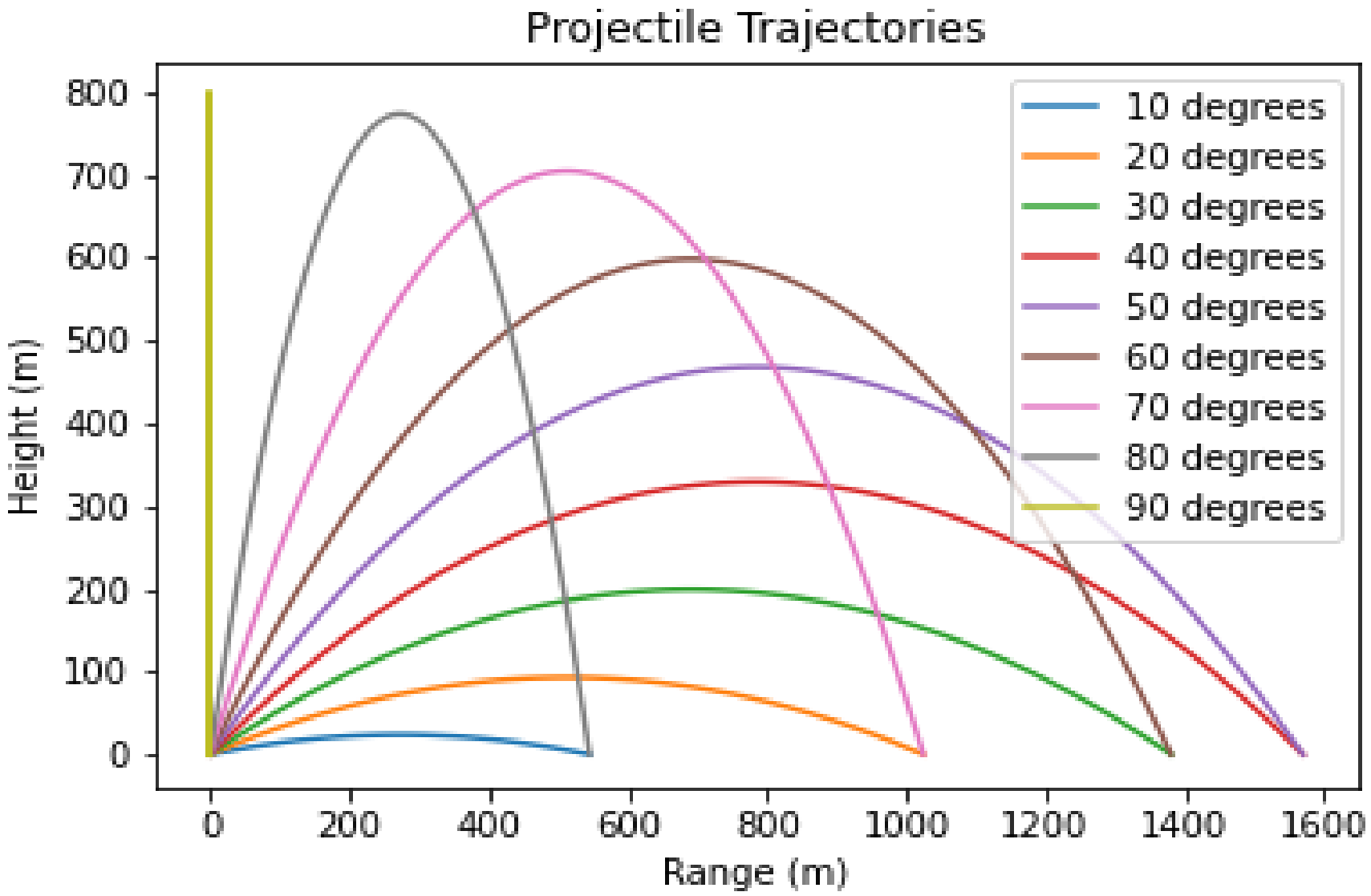
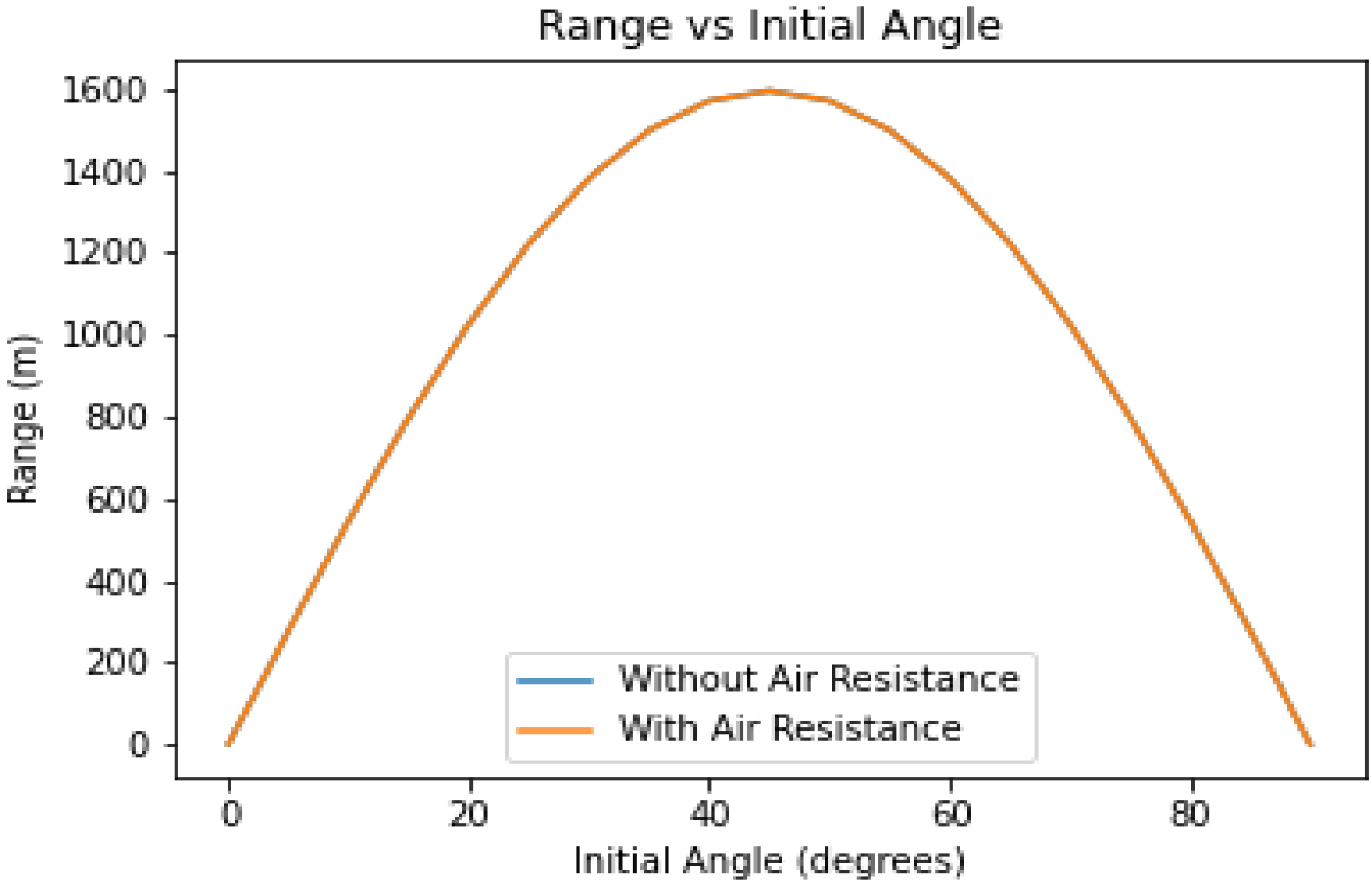
46344

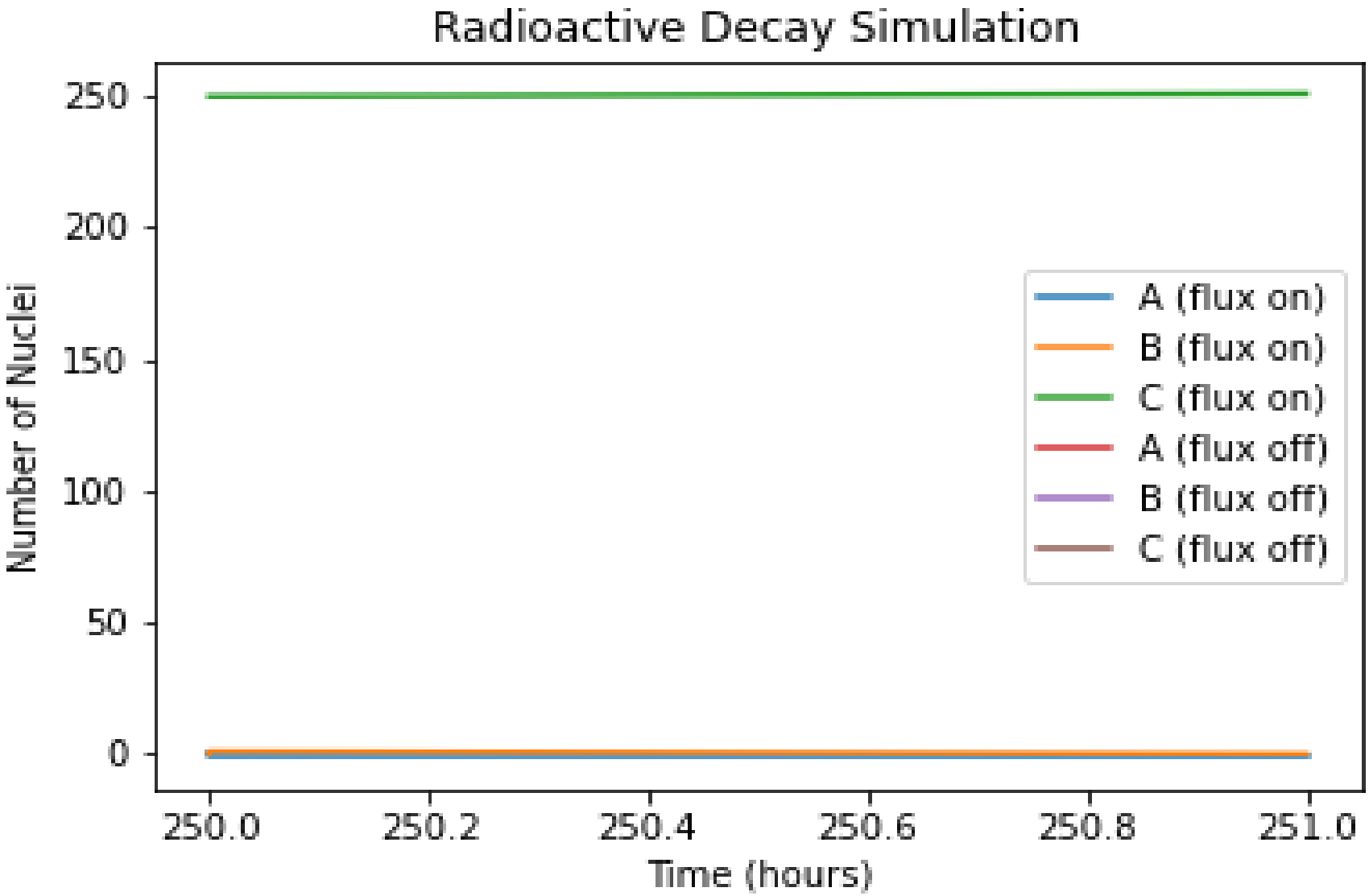

Difference between Analytical and Numerical Derivatives
Difference
x
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−3
−2
−1
0
1
2
3
dx too large
dx about right
dx too small

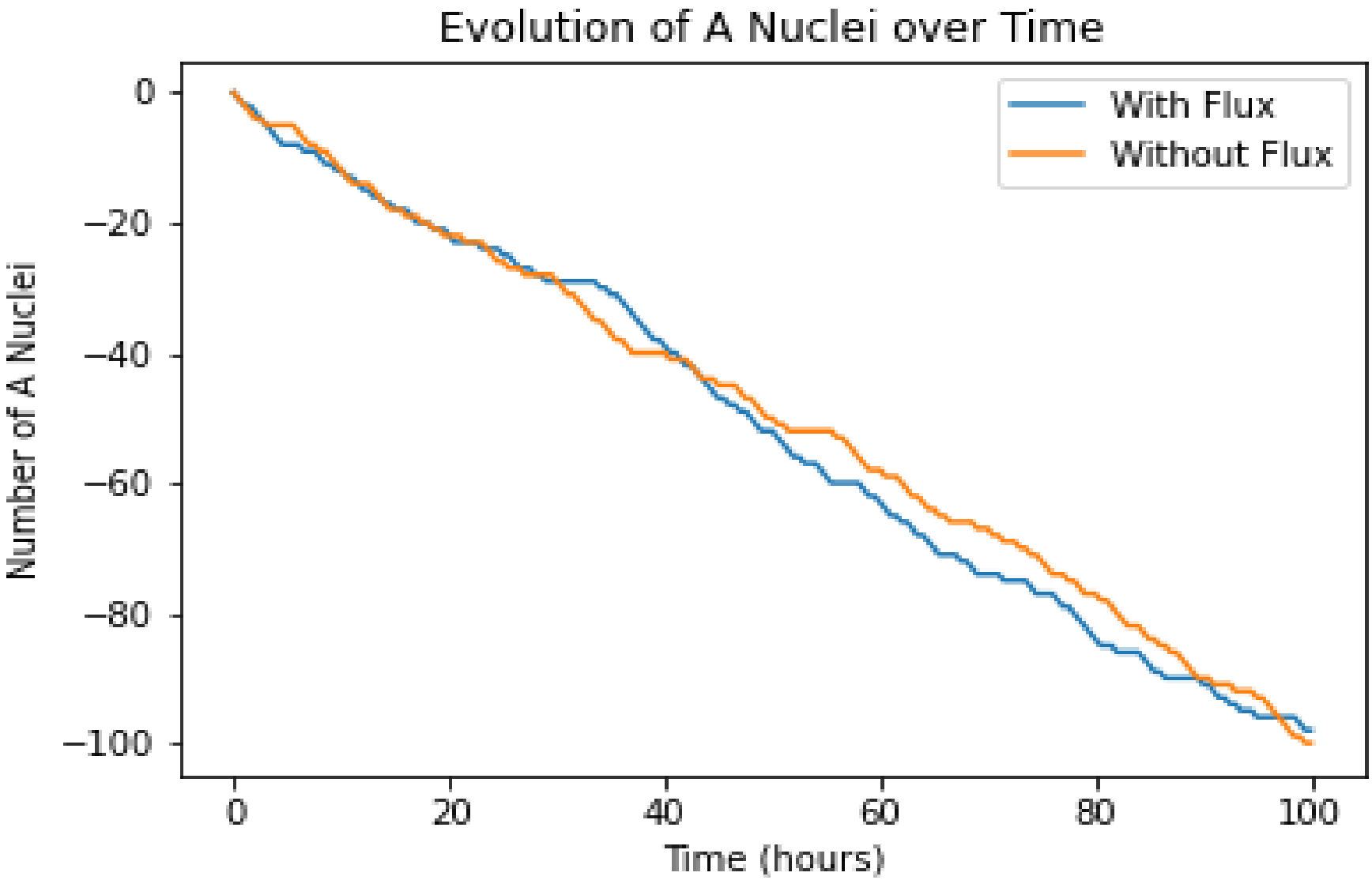

Fractional Error in Numerical Integration using Simpson's Rule
6 x 10^0
4 x 10^0
3 x 10^0
2 x 10^0
10^1
10^2
10^3
Number of panels

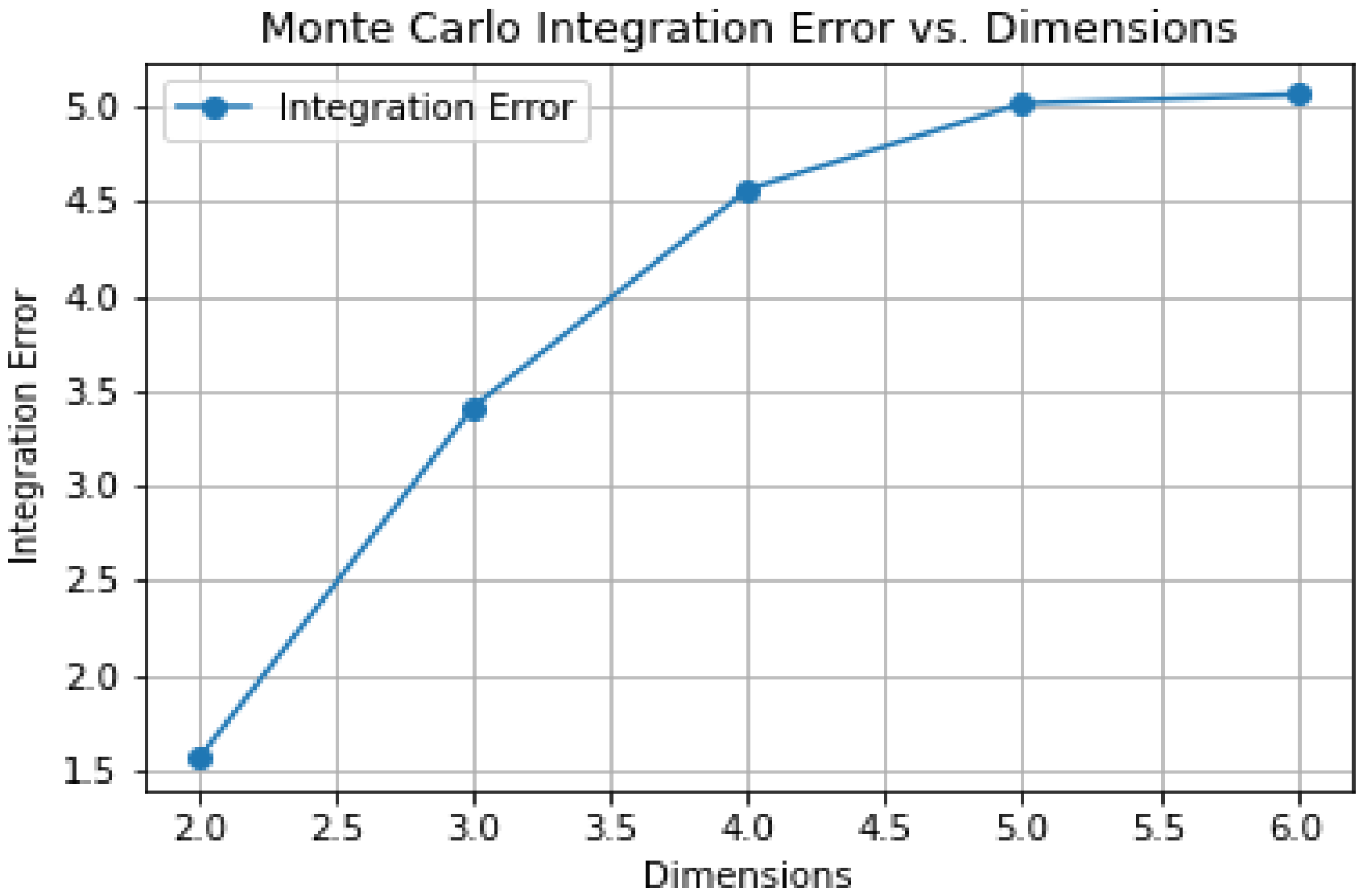

Error in Numerical Methods
1e−11
Euler Error
RK4 Error
3.0
2.5
2.0
1.5
1.0
0.5
0.0
Error
0
20
40
60
80
Time (years)

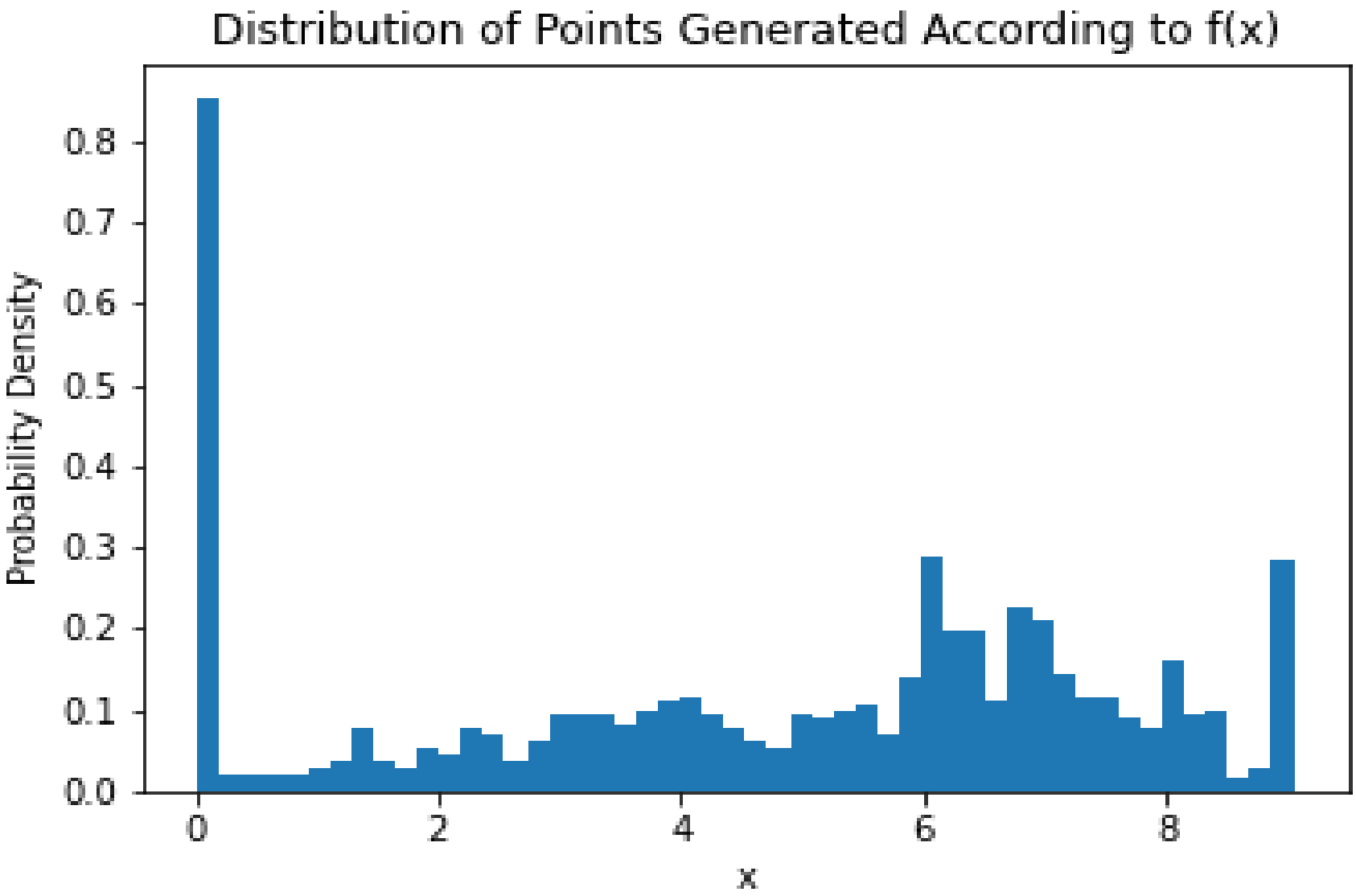

Projectile Trajectories
Height (m)
Range (m)
0
100
200
300
400
500
600
700
800
0
200
400
600
800
1000
1200
1400
1600
10 degrees
20 degrees
30 degrees
40 degrees
50 degrees
60 degrees
70 degrees
80 degrees
90 degrees

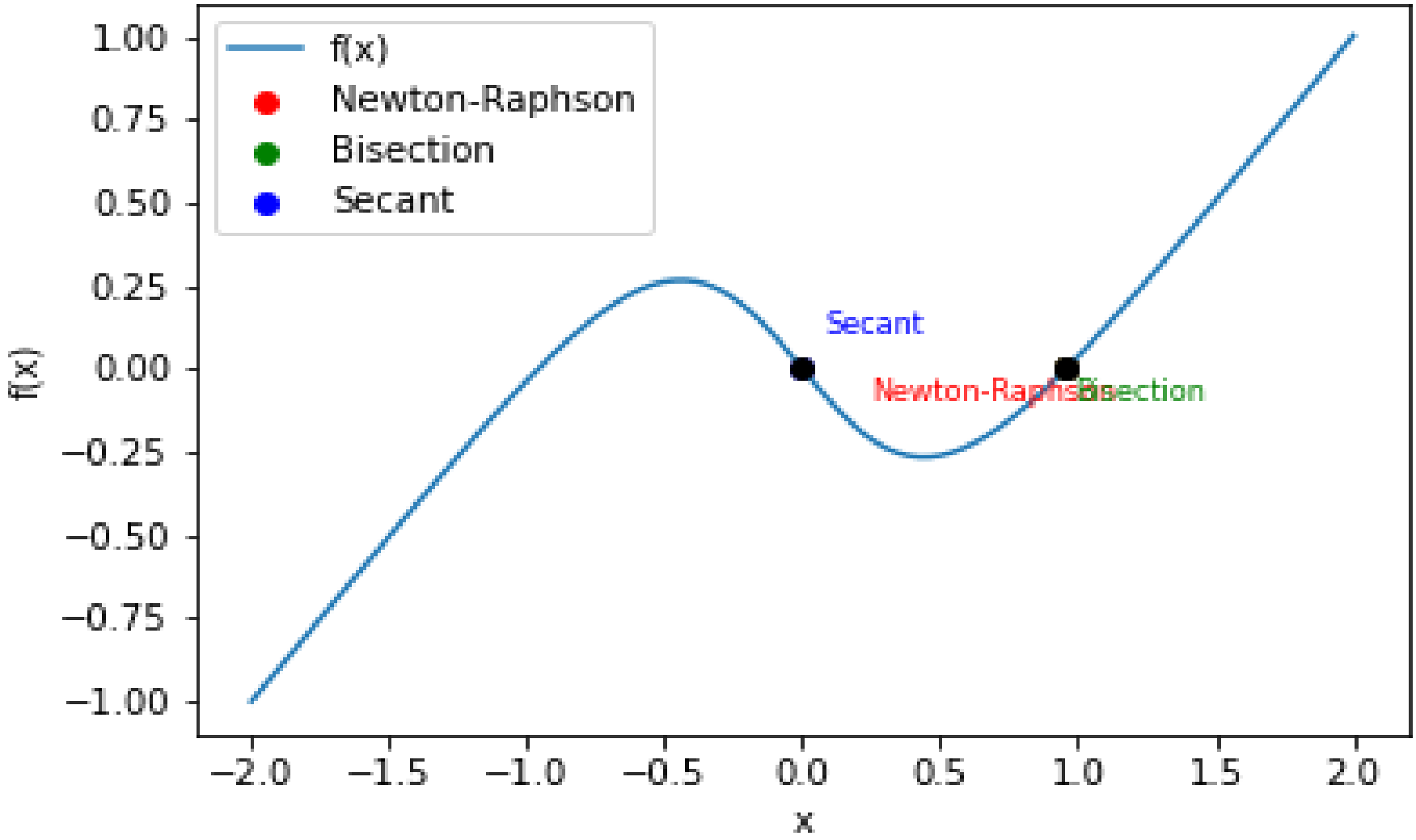

Range vs Initial Angle
Range (m)
1600
1400
1200
1000
800
600
400
200
0
0
20
40
60
80
Initial Angle (degrees)
Without Air Resistance
With Air Resistance

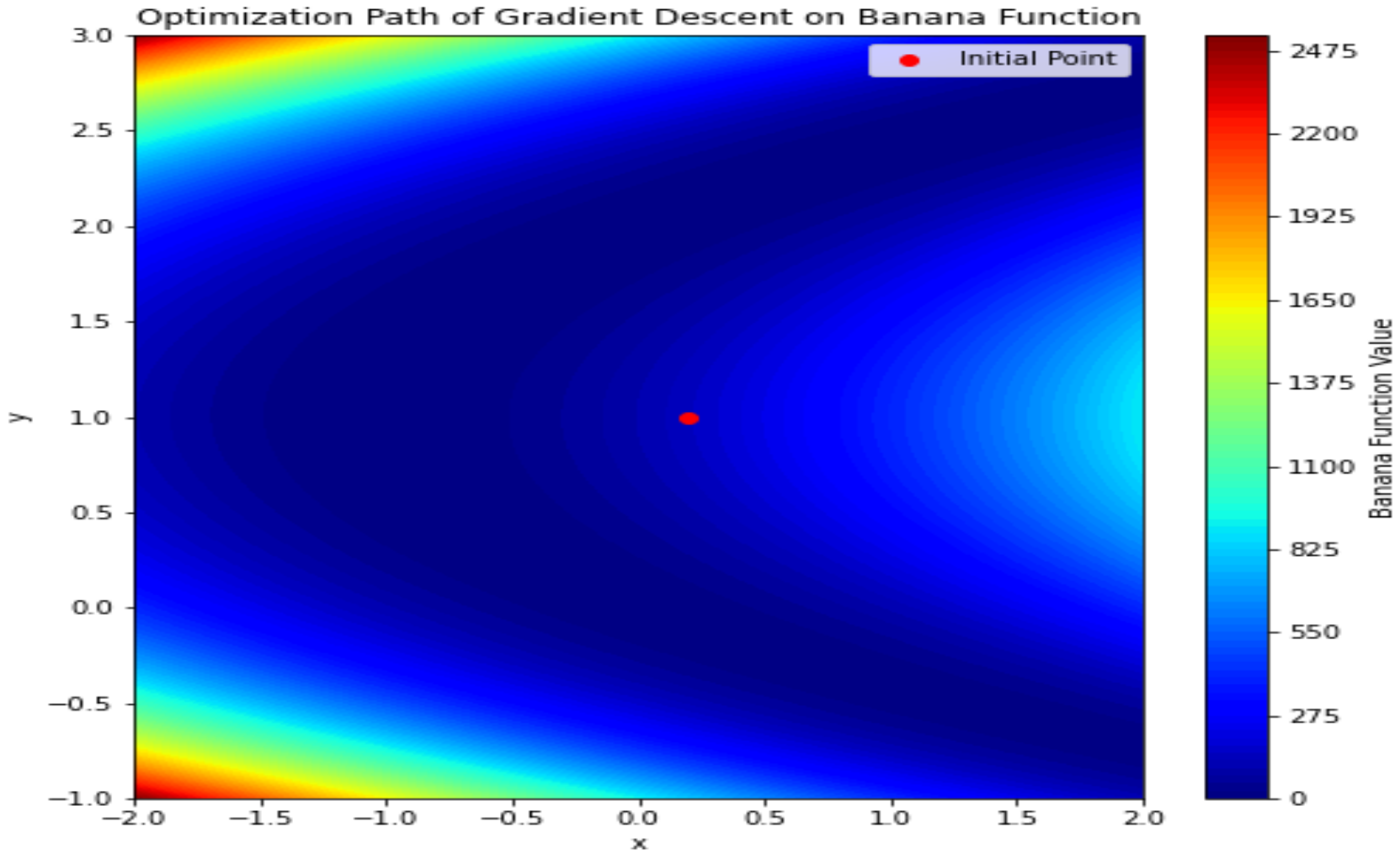

Radioactive Decay Simulation
Number of Nuclei
250
200
150
100
50
0
250.0
250.2
250.4
250.6
250.8
251.0
Time (hours)
A (flux on)
B (flux on)
C (flux on)
A (flux off)
B (flux off)
C (flux off)

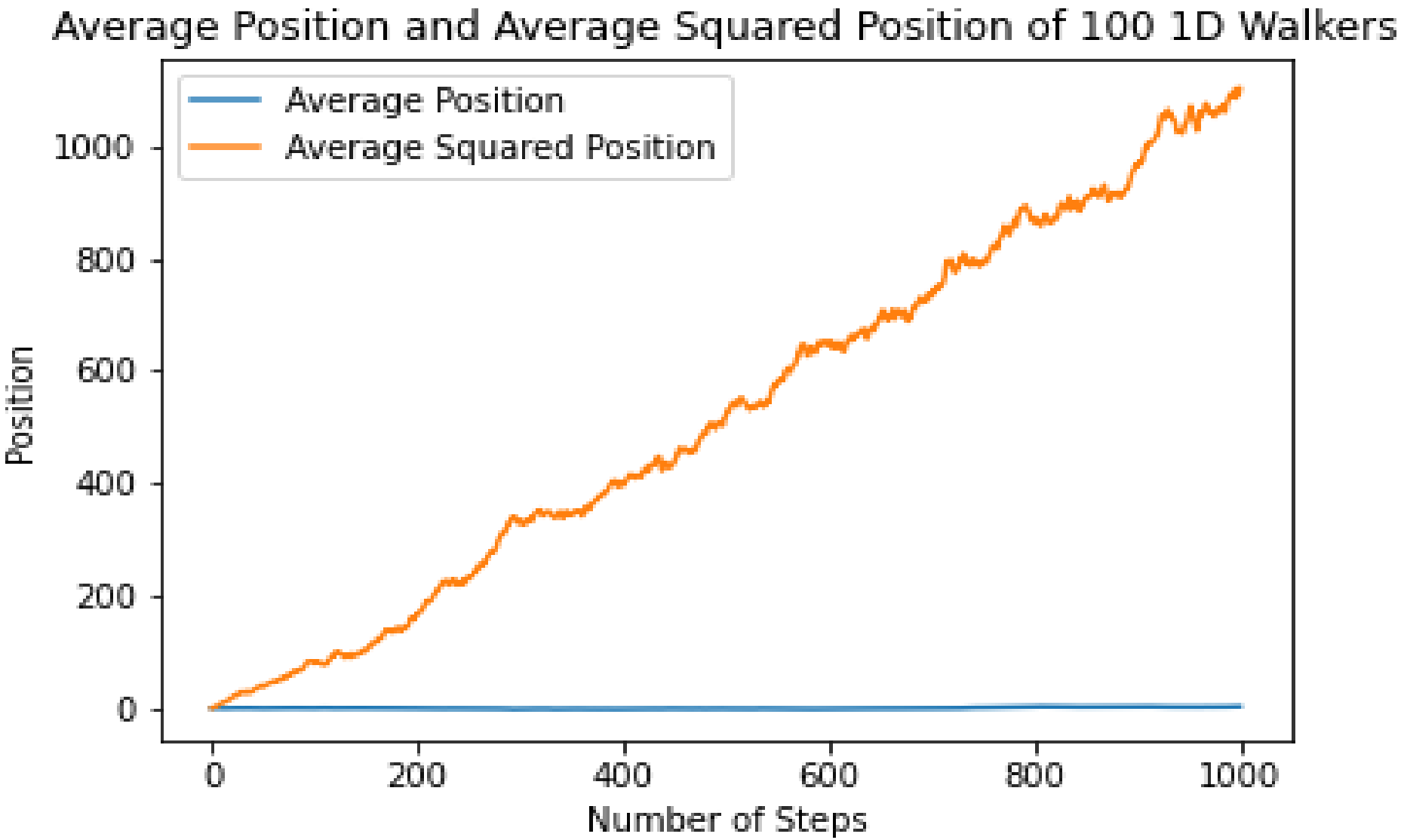

Evolution of A Nuclei over Time
With Flux
Without Flux
Number of A Nuclei
0
−20
−40
−60
−80
−100
0
20
40
60
80
100
Time (hours)

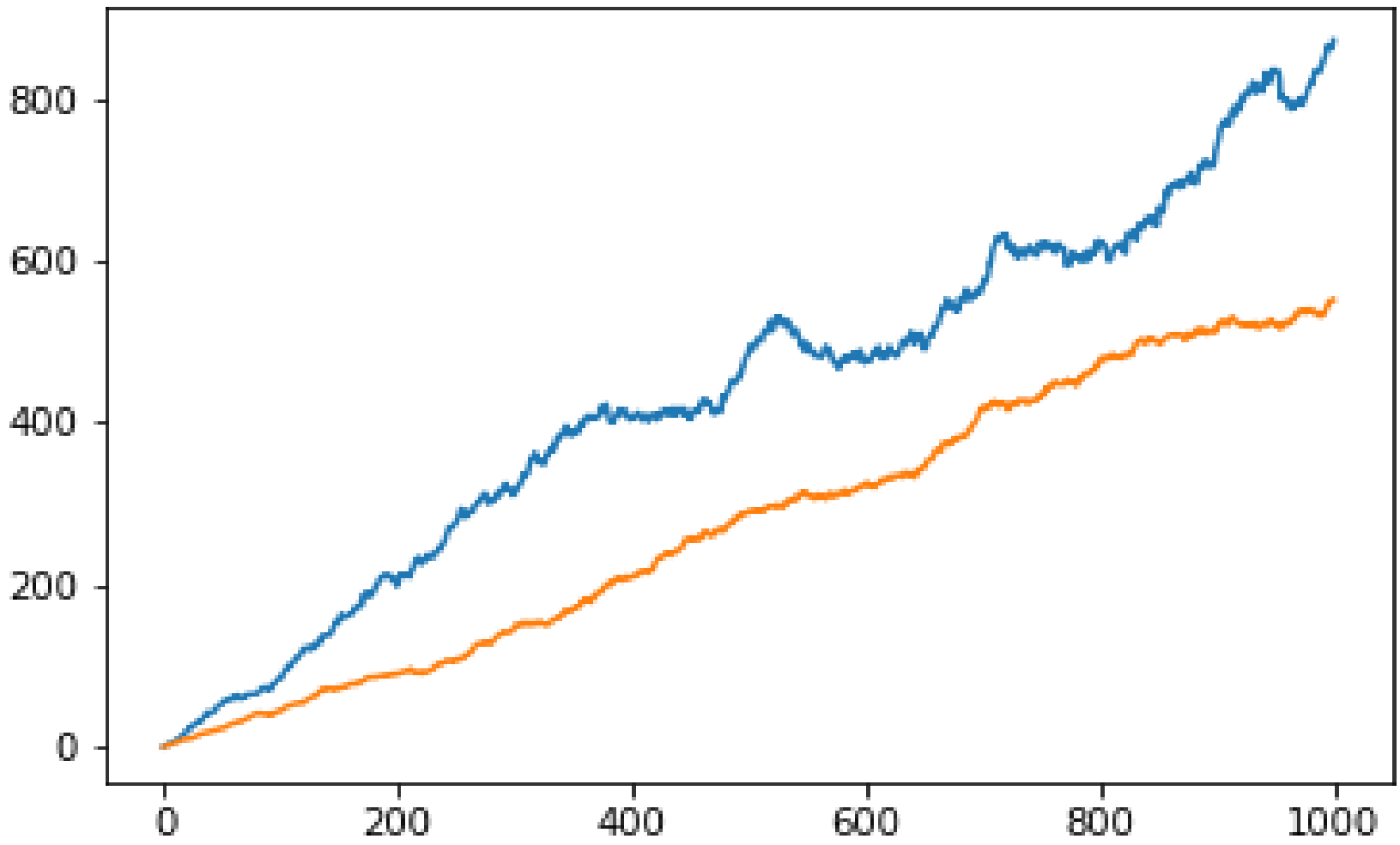

Monte Carlo Integration Error vs. Dimensions
Integration Error
Integration Error
Dimensions
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
5.5
6.0

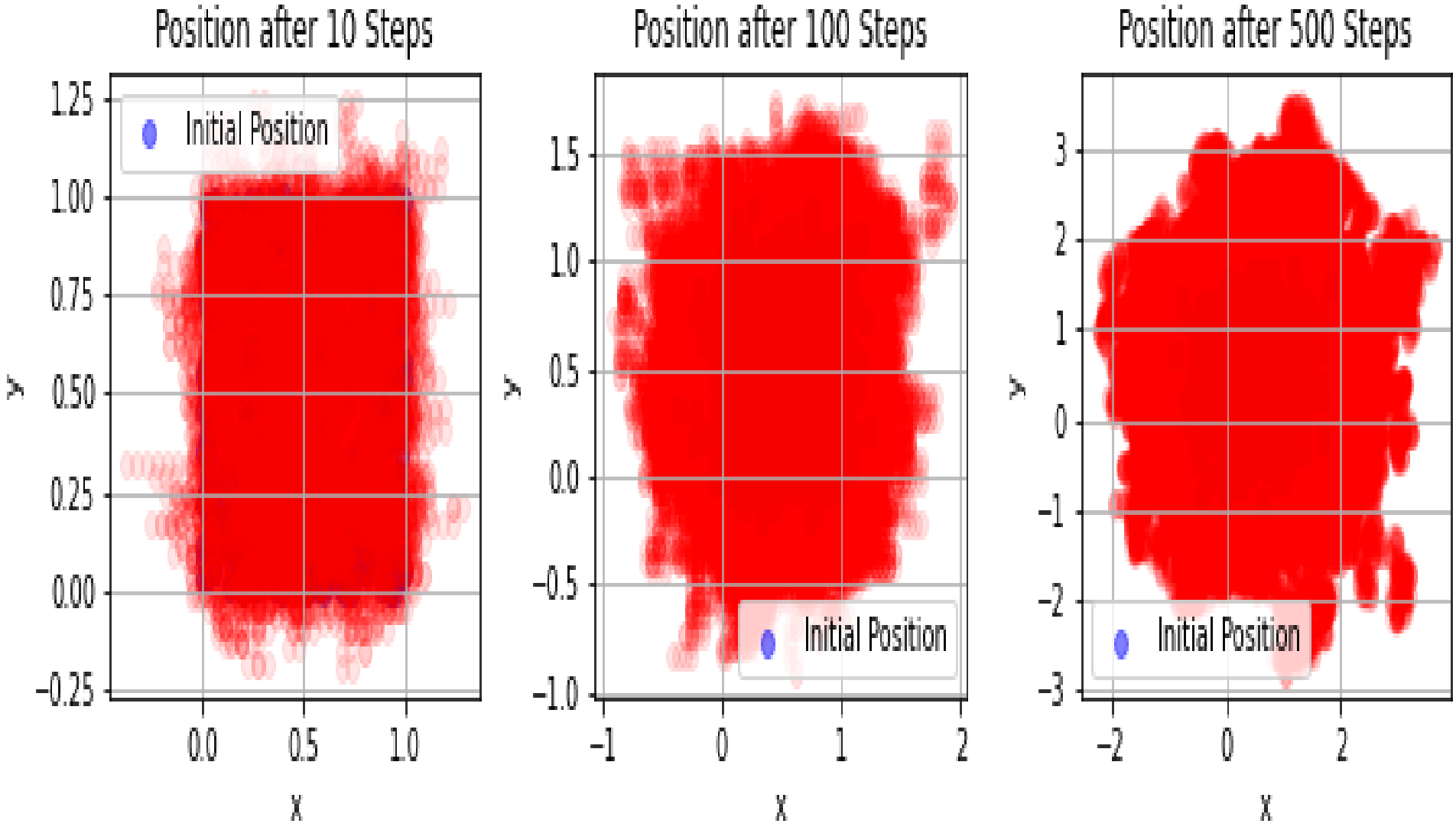

Distribution of Points Generated According to f(x)
Probability Density
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0
2
4
6
8
x


f(x)
Newton-Raphson
Bisection
Secant
Secant
Newton-Raphson
Bisection
1.00
0.75
0.50
0.25
0.00
−0.25
−0.50
−0.75
−1.00
f(x)
−2.0
−1.5
−1.0
−0.5
0.0
0.5
1.0
1.5
2.0
x


Optimization Path of Gradient Descent on Banana Function
Initial Point
3.0
2.5
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
y
−2.0
−1.5
−1.0
−0.5
0.0
0.5
1.0
1.5
2.0
x
2475
2200
1925
1650
1375
1100
825
550
275
0
Banana Function Value


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


800
600
400
200
0
0
200
400
600
800
1000


Position after 10 Steps
Initial Position
1.25
1.00
0.75
0.50
0.25
0.00
−0.25
0.0
0.5
1.0
x
y
Position after 100 Steps
Initial Position
1.5
1.0
0.5
0.0
−0.5
−1.0
−1
0
1
2
x
y
Position after 500 Steps
Initial Position
3
2
1
0
−1
−2
−3
−2
0
2
x
y

AI?