Assignment 8

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Question 1: Random walk

Random walk is the process by which randomly-moving objects wander away from where they started.Random walk simulation is performed and plotted using python.As it is random walk,probability of moving every side should be same and that's why theoretically $X_{avg} \approx 0$,$Y_{avg} \approx 0$ this should be the outcome.But I got some value range between -2 to +2.Though average distance in any direction(X_{avg} or Y_{avg}) divided by $\sqrt{R}^2$ should be 0.1 for 100 walk and I am getting approximately 0.15 and greater than that .R_{rms} vs $\sqrt{N}$ (N= step number) is plotted.The graph is straight line which is same as theoretical predictions because R_{rms} should be equal to $\sqrt{N}$.Now the plotted graphs are attached below.
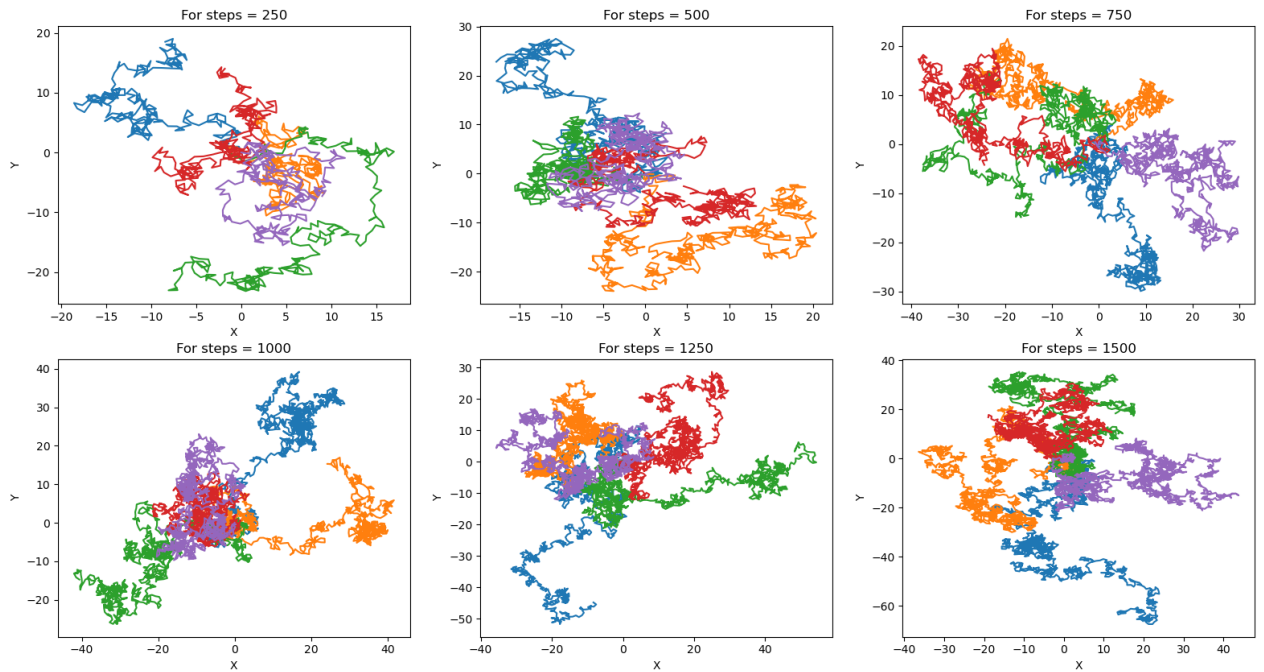

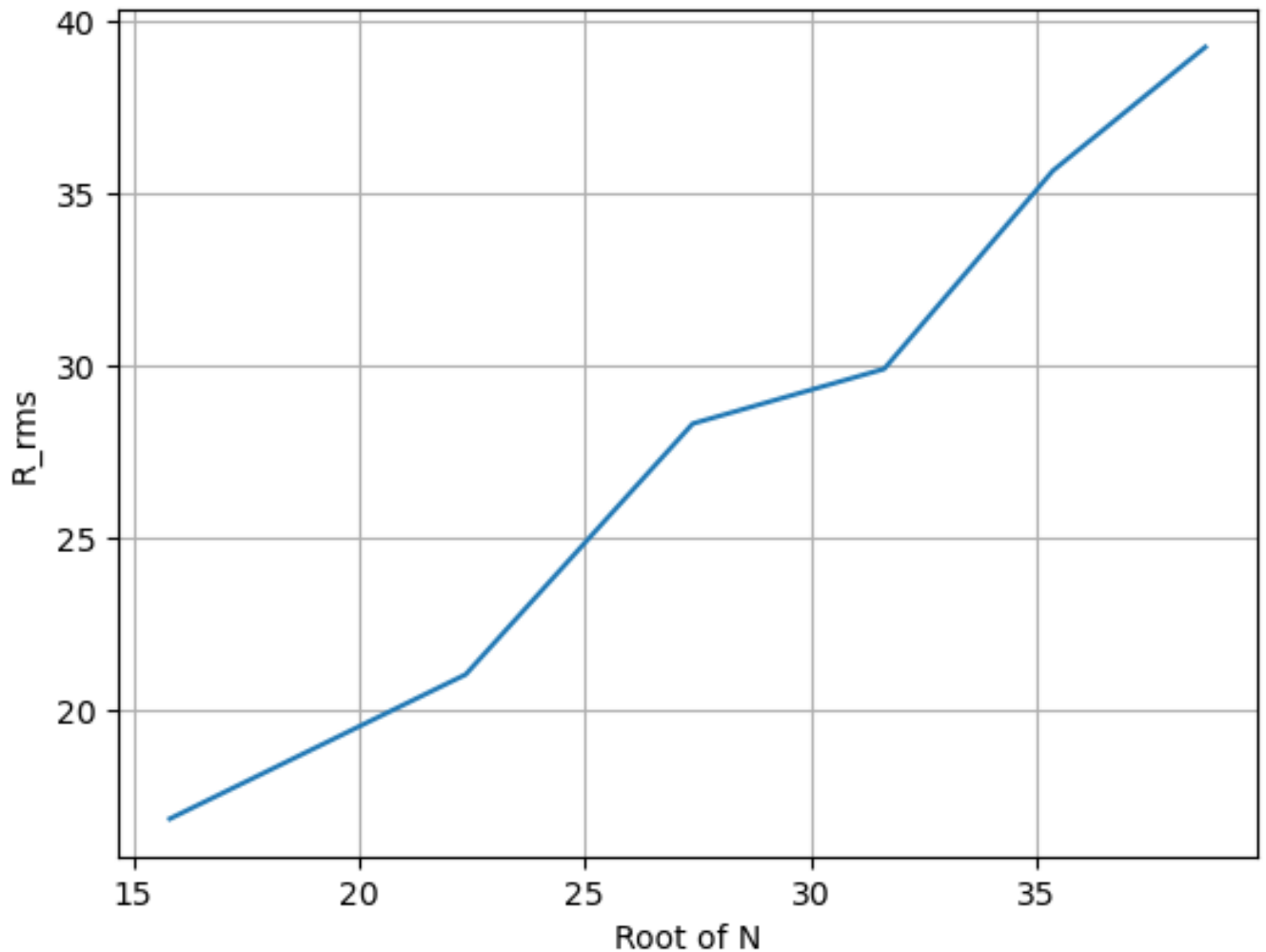Figure 1: Random walk for different steps No.

Figure 2: R_{rms} vs $\sqrt{N}$

There is some deviation from theoretical interpretation because random number generator is not proper random.

Question 2:Volume of Ellipsoid (Monte-carlo method

Monte Carlo methods are a broad class of computational algorithms that rely on repeated random sampling to obtain numerical results.Using this probabilistic method here we will calculate the volume of ellipsoid.Here we generate random points and do the area ratio by counting how much dots are inside ellipse and box and how much dots are inside the box only.With increasing number of points we can get tends to actual value of the volume of ellipse.Volume per 100 steps is plotted against analytical value and we can see it is converging graph.Fractional error vs steps is also plotted and fractional error is also decreasing with increasing the number of points.Now the plotted graphs are attached below...
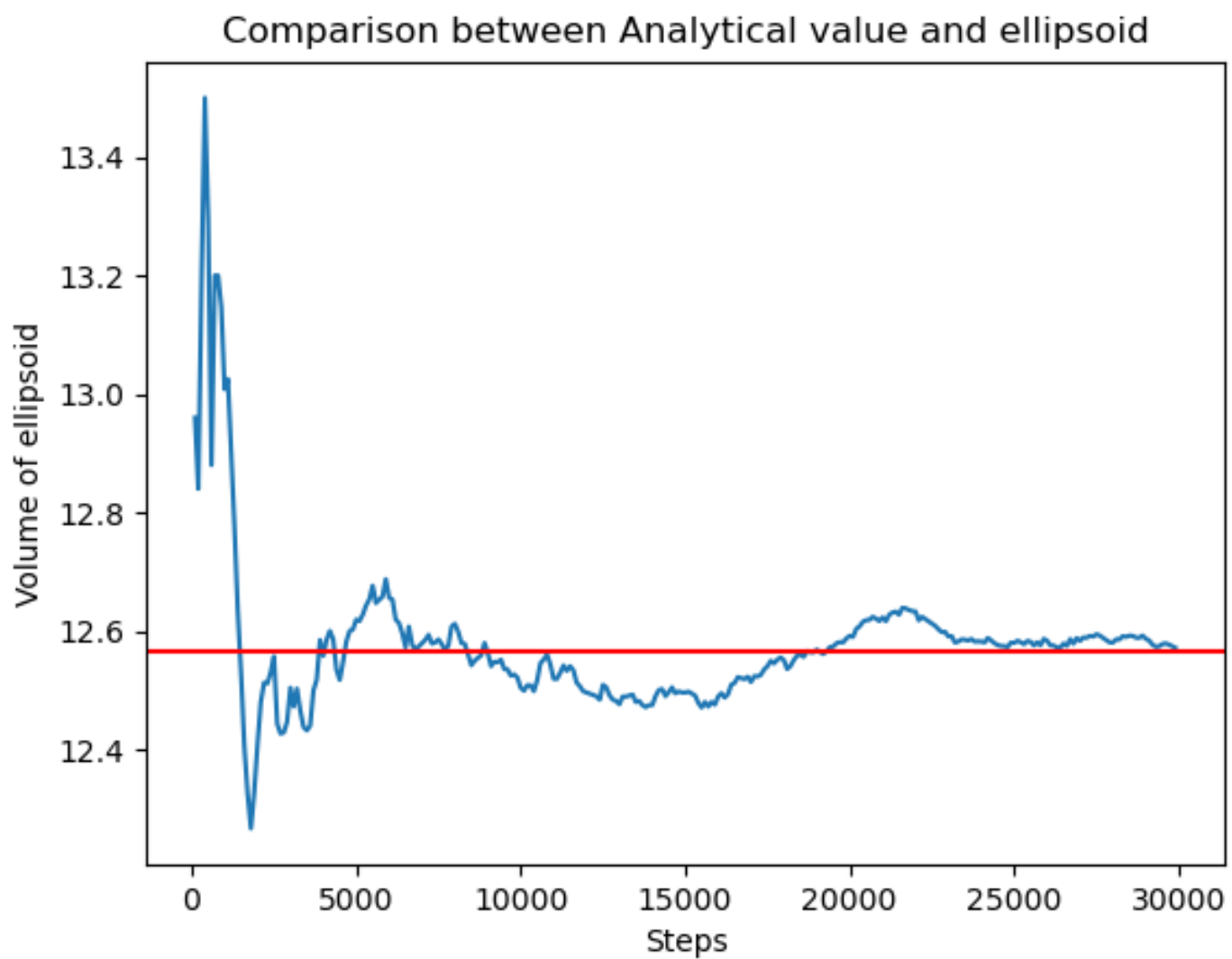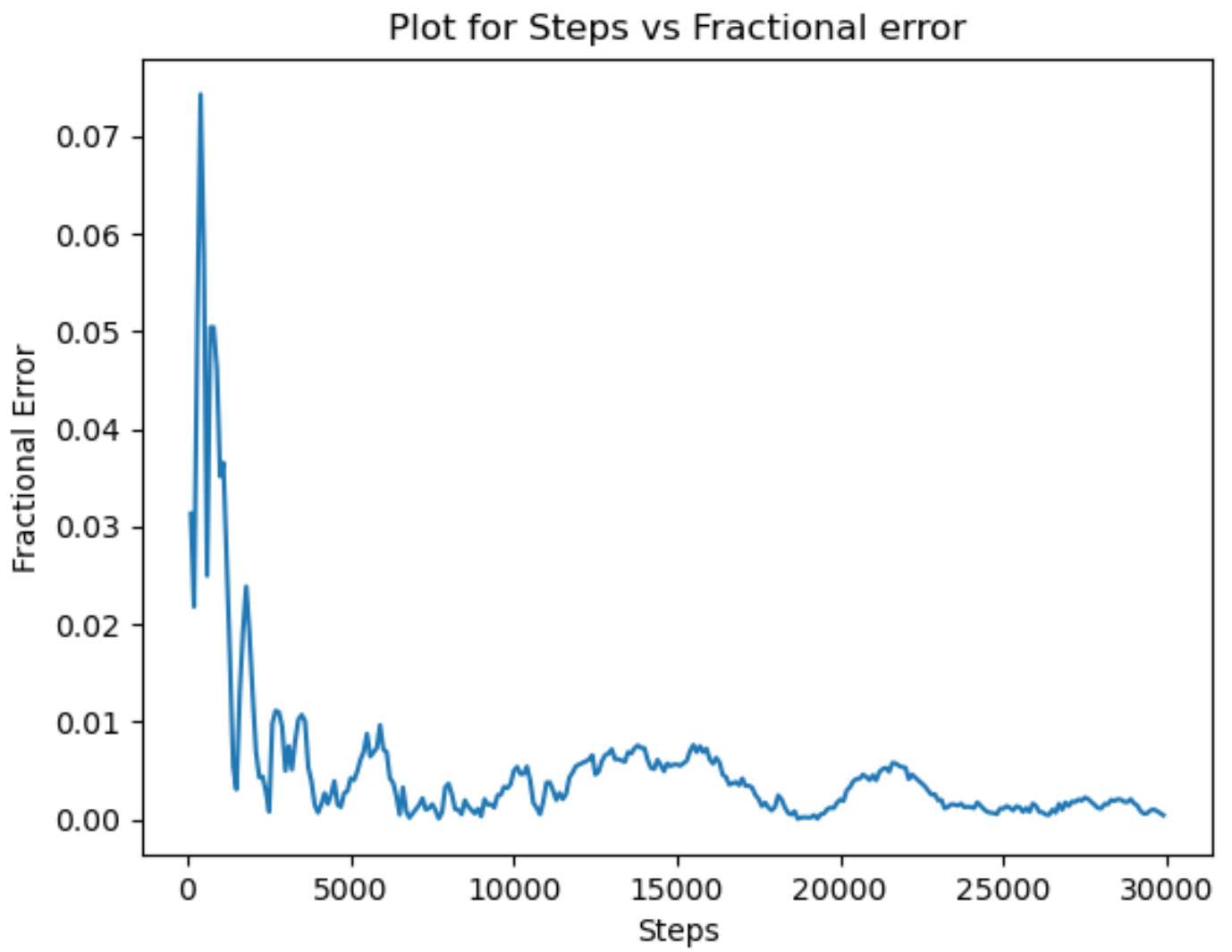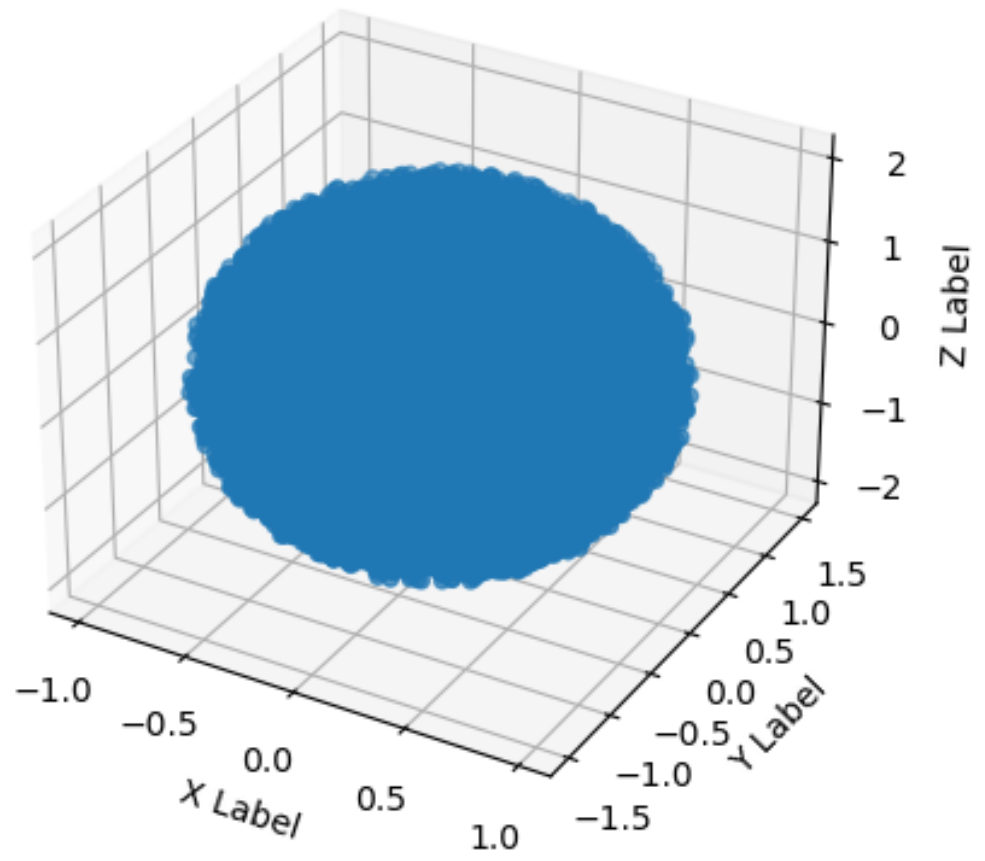
Figure 3:

Figure 4:

Figure 5: 3D plot