1 RANDOM WALK

The problem in Q1 is of random walk in 2-dimension where the polar angle θ is randomly taken in the interval [0,2π]. Random generator predefined in the python library is used to change the polar angle(θ) which then changes x,y coordinates. The step size used in the problem ranges from 250-10000. All the walks were started from the origin. The plot of Rrms vs $N^{1/2}$ was tending to linear. It matches the theoretical prediction that for large N Rrms becomes $N^{1/2}$ function.

2 MONTE CARLO 3D

The accuracy of Monte-Carlo method increases as the number of points increases. Random generator function is used to choose the points inside the boundary. A 3-D scatter plot of the points with specified boundary gives an ellipsoid. As the number of points increases the volume of the integral approaches the analytical value which can be seen from the graph plotted. The fractional error also approaches zero for large enough N.