

# Computational Lab(P-342)

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## Assignment 8

### 1 Random walk:

In random walk problem we move unit distance in any random  $\theta$ (theta) direction, and try to calculate the average displacement in X and Y-axis, radial distance and the root mean square of the radial distance.

In our plot between  $R_{rms}$  and  $\sqrt{N}$  our slope is very near to 1, which depicts  $R_{rms} \approx \sqrt{N}$ .

In case of our average displacement in X and Y they are very close to zero, which shows the equal probability of the particle to move in +ve and -ve axes.

This problem helps to understand the nature calls as most of them can't be proved.

## 2 Volume of Ellipsoid(Monte-Carlo method):

In this problem we have to find to volume of the ellipsoid by Monte-Carlo method. In this problem we have tried to throw some random points inside a cuboid and then try consider the points that have followed the equation the ellipsoid. Thus by finding the probability we can find the volume of the ellipsoid as:

$$\frac{\text{Volume of ellipsoid}}{\text{Volume of cuboid}} = \frac{\text{Points in ellipsoid}}{\text{Total no. of points}} \quad (1)$$

In our plot between N and Volume of the ellipsoid as the N value increases our calculated value converges to the analytical value.

For the plot between Fractional error and N we saw that as our N value keeps on increasing the error in the calculated value keeps on decreasing.

In our plot of ellipsoid we tried to go till max of 50,000 points.