# Computational Physics Project

Nishant Pratim Das, 1811099

## Exercise 1

A random walk problem in a 2-D plane was simulated for 5x100 walks (100 walks of 5 different number of steps). Average value of (final) x, y, radial distance, rms radial distance was found for each of these walks. The first 5 walks in each set were graphed. As N increased we saw that the walkers are getting further and further away from the origin. This is in sharp contrast to the 1-D random walk problem where the walker stayed in and around the origin for all N (except some fluctuations). rms radial distance was plotted against square root of N and it was found to be a straight line which suggests the previous statement: The walker moves further and further away from the origin.

## Exercise 2

Monte Carlo method was used to find the volume of an ellipsoid. A just big enough cuboid was taken to engulf the given ellipsoid. We saw that very fast the calculated value came close to the true value but it was not "converging" to 1 value. A correct way to report the value of the volume would be to take average from n1 to n2 where both n1 and n2 are large and n2>n1. In this case the analytic result is very easy to find ($\frac{4}{3}\pi abc$) but in higher dimensions and/or complicated shapes, this method turns out to be very useful even over other numerical methods.