Discussion Q1

The 2D random walk simulation was performed for 5 different step sizes of 300, 500, 700, 900 and 1100 starting from origin. A function called RandomWalk was created which took number of steps as input and returned values of R, Rrms, xavg and yavg. For every step size, data files were created for first 5 random walks. R, Rrms, xavg and yavg for all walks were calculated by taking their average over all 100 walks. xavg and yavg obtained was close to zero for all step sizes. R increased on an average with increasing step size. The plot for Rrms vs was obtained almost as a straight line in agreement with theory.

Discussion Q2

Volume of ellipsoid was calculated for 10 trails. Points were plotted randomly in a specific volume and it was checked for every point whether the equation holds. The analytical result for volume is 12.56637, was obtained by integration. For increasing N the volume obtained, though fluctuating moves closer to analytical value. The same trend was observed for fractional error with increasing step numbers. These plots were created using matplotlib. A 3D scatter plot was created for N =10000 using gnuplot. An ellipsoid was obtained with |x|≤1, |y|≤1 .5 and |z|≤2 for all points, as specified by the semi-axes of the ellipsoid.