And ESCI7205
HW 8
Due Th., 19 Nov.

In the early 1800's an English botanist, Robert Brown, observed that pollen grains contained in a drop of water wiggled about in jagged, random path. Later this behavior was attributed to molecular fuctuations in the water. Water molecules impinge on the small particle causing random forces acting in random directions. If the particle is small enough, then the particle will move about in response to these random forces.

A simple model of Brownian motion in two dimensions is as follows: Take a particle and place it at the origin x = y = 0. A normally distributed random number will be added to horizontal and vertical coordinate at each time step. Iterate for many steps and follow the path of the particle. See the MATLAB command randn for generating random numbers.

Write a program that plots the path (in x-y space) of one particle over 10,000 iterations. Try running the program a few times and see what patterns you develop.

Now write some MATLAB code that computes the total distance of a particle from the origin after N iterations. Embed this code in a loop to create a matrix where each column contains one particles distance from the origin and the row indicates iteration number. Do for 10,000 iterations. The result should be a matrix with 100 columns and 10,000 rows.

Plot on a log-log plot the average (over 100 particles) distance moved as a function of iterations. See if you can _gure out the scaling with N; i.e. does the total distance vary with N^2, $N^{1/4}$, etc?? What is the furthest a particle traveled? What is the least a particle traveled?

Avoid loops (I did it up without any loops).