Homework Assignment 3

Due: Thursday October 1, 11:59 pm, UBlearns Digitial Dropbox

PHY 410: choose any two problems. **PHY 505: work all three problems**

1. Modify the program `pi.cpp` to compute the volume of a sphere of radius $R = 1$ in three dimensions. Plot the standard deviation versus number of random points and fit this data to a model function. Repeat for a different random number generator and comment on any differences you observe.

   Note: Determine the standard deviation just like you would in lab by repeating the measurement some fixed number of times!

   `http://www.physics.buffalo.edu/phy410-505/topic2/lec-2-1.pdf`

2. Calculate the entropy of an ensemble of independent random walkers (drop of cream) starting at the central site of a two dimensional square lattice (cup of coffee) as a function of time. Measure the time needed for the cream to become thoroughly mixed with coffee for cups of different sizes. Plot mixing time versus cup size and fit to a model function.

   `http://www.physics.buffalo.edu/phy410-505/topic2/lec-2-2.pdf`

3. Compare the CPU times required to generate samples of SAWs of various lengths using the simplistic and reptation algorithms. Use the reptation algorithm to measure the Flory exponent for SAWs on a 2-D lattice. Compare your result with the non-SAW random walk of the previous lecture and explain the difference.

   `http://www.physics.buffalo.edu/phy410-505/topic2/lec-2-3.pdf`