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1.) Given the Maxwell-Boltzmann distribution

$$N(v) = 4\pi \left(\frac{m}{2\pi kT}\right)^{3/2} v^2 e^{-mv^2/2kT}$$

a.) Show

$$\langle v \rangle = 4\pi \left(\frac{m}{2\pi kT}\right)^{3/2} \left(\frac{2kT}{m}\right)^2 \frac{\Gamma(2)}{2}$$

b.) Show that the energy fluctuation

$$\frac{1}{4}m^2 \left\langle \left(v^2 - \langle v^2 \rangle\right)^2 \right\rangle = 3/2 (kT)^2$$

Note:
$$\langle (v - \langle v \rangle)^2 \rangle = \langle v^2 - 2v\langle v \rangle + \langle v \rangle^2 \rangle$$
$$= \langle v^2 \rangle - (\langle v \rangle)^2$$
$$= \frac{3kT}{m} - \frac{8kT}{m} = \text{velocity fluctuation}$$

$$\frac{1}{4}m^2 \left\langle \left(v^2 - \langle v^2 \rangle\right)^2 \right\rangle = \langle v^4 \rangle - \left(\langle v^2 \rangle\right)^2$$
$$= \frac{1}{4}\left(15(kT)^2 - (3kT)^2\right)$$

2.) Calculate π using the MC method described in the Notes on Day 1 pg 6-7

3.) Create Histograms using the RNG and Root.

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3.) steps

a.) login to inca.iac.isu.edu

b.) copy RNG files into your account

cp␣ -R␣ ~tforest/NucSim␣ ./

c.) move to Day1 subdirectory

cd␣ NucSim/Day1

d.) Follow instructions in README file

less␣ README

e.) print out one of the histograms you created. Use ROOT to put your name in the title of the histogram