PY 541 Problem Set 3: HW Exercises Due on Oct 6th

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> Read the assigned material before class. Pre-class questions are due midnight the night before before Tuesday and Thursday classes and noon on Wednesdays when homeworks are not due (usually Thursdays), and otherwise should be turned in with the homeworks.

Welcome to PY 541 Statistical Physics. This is a graduate course that assumes you have taken an undergrad course on these topics (e.g. Thermal Physics, Statistical Physics, etc.). It also assume some basic familiarity with core mathematical areas: probability, linear algebra, vector calculus as well rudimentary programming skills (Python, Mathematica, etc). If you do not feel comfortable with these concepts, please come talk to me.

All exercises are from second edition of Jim Sethna's book available at:

https://www.lassp.cornell.edu/sethna/StatMech/index.html.
There are also hints and code for computational exercises at this website.

Readings and Pre-class questions

Tuesday 9/27:
Read: Chapter 4. In-class question: 3.16 Taste, smell, and μ
In-class question: 3.5 Hard sphere gas
In-class question: 3.11 Maxwell Relations
Wednesday 9/28:
Read: Chapter 4 Pre-class question: 4.6 Perverse initial conditions
In-class question:4.2 Liouville vs. the damped pendulum
Thursday: 9/30
Read: Chapter 5, Sec. 5.1, Sec. 5.2.1 (Entropy of mixing)
In-class question: 5.1 Life and the heat death of the Universe
In-class question: 5.4 Black hole thermodynamics
In-class question: 5.22 The Dyson sphere
Tuesday: 10/4
Read: Chapter 5, Sec. 5.2.2 (Residual entropy of glasses)
Pre-class question: 4.5 No Hamiltonian attractors
In-class question: 5.12 Rubber band
In-class question: 5.23 Entropy of the galaxy
Wenesday:

Pre-class question: 5.18 Entropy of socks
In class: TBD.

Homework Exercises

All hints are available at: https://www.lassp.cornell.edu/sethna/StatMech/EOPCHintsAndMaterials.html or ask me directly.

1. 4.7 Crooks

2. 4.8 Jarzynski.

Please also do two out of the following three problems:

1. 3.14 Pendulum shell. (more mathematical)

2. 5.8 The Arnol'd Cat Map (more conceptual)

3. 4.3 Invariant Measures (more advanced)

Honor Code

All students are expected to follow the BU Honor Code. While collaboration is allowed and encouraged on HWs, each student should write up their own solutions. Copying HW is strictly forbidden. The students are allowed to consult all resources and books. However, students are NOT allowed to consult problem solutions from previous years or as found on the web.