Physics 314
Classical and Computational Mechanics
Midterm Exam 2

This is a midterm exam. You may use a calculator, paper, MATLAB, your notes, my notes, Taylor, and a pencil/pen. You may **not** consult others, including Professor Google, except for me.

You will have 24 hrs to do this exam from the moment you open the envelope, although please eat, sleep, and relax a bit sometime in that interval. It is my intention that this exam will take you about 4 or 5 hours of *active* work to complete, although you're invited to ruminate on it while eating, sleeping, showering, exercising, doing taxes, etc.

Please write up your solutions using many complete sentences and diagrams and figures as needed. Remember: I haven't worked every angle of this problem, so your solution will probably be at least partially new to me. When you are done, staple your work, put it into the envelope, and turn it in to me at your first convenience.

1 The Problem

Picture two masses (perhaps equal, perhaps not) connected by a spring. They are spinning about an axis perpindicular to the line connecting them and flying through the air on Earth. Tell me some interesting things about this problem. You may simplify things as you like (for example, make the masses the same mass or ignoring friction), but please be explicit in your write-up what you did. Also remember that this is an exam and your goal is to impress me with what you've learned this term. In other words, it's OK to simplify, but if you only do very simple aspects, I will assume that that's all you know how to do. So try to stretch at least some aspect of the problem to make it interesting. On the other hand, please don't try to explore *every* aspect of this problem. This is a rich problem with many possible subtlties and it would take days or weeks to explore them all. You'll be fine if you convince me that you could explore most of them, given the free time!

Some avenues to consider: Lagrangians Lane, Conservation Court, Hamiltonian Hill, Center of Mass Circle, Friction Freeway, Computational Cove, Simple Harmonic Circle, etc.

Time opened:

Time finished: