Homework 1, PHY4410, Spring '17.
Due by 3:30pm Tues Jan 24

1. Find Hamilton's equations of motion for a block sliding down an incline of angle θ in a gravitational field of acceleration g.

2. Two beads of mass m are connected by a massless spring (with spring constant k and relaxed length λ) and are free to move along a frictionless horizontal wire. Let their positions be x1 and x2. Find the Hamiltonian in terms of x1, x2 and their conjugate momenta, and then write down the four Hamilton's equations.

3. Repeat problem 2, only now replace x2 with x1+d (where d is now the distance between the two masses), and find Hamilton's equations in terms of x1 and d and their conjugate momenta. Also, list any and all conserved quantities in the system.

4. Log in via ssh to hedges.belmont.edu. In your home directory, create a sub-directory named phy4410, and cd into that directory. Using a UNIX text editor such as emacs, vi or nano*, create a file called "file1.txt" with the following content:
My name is <your full name>.
This is my first UNIX file.

Save the file and leave it in the directory.

5. Follow the Python tutorial at www.learnpython.org. Do all of "Learn the Basics".

6. **Mac users**: Download and install both Xcode and either the Homebrew (http://brew.sh/) or MacPorts (https://www.macports.org/) distribution.
Windows users: Download and install VirtualBox. Also download an Ubuntu .ISO installation file. Run VirtualBox (allocating, say, 6GB of disk space and 1GB of RAM) and direct it to the Ubuntu ISO file for the operating system of choice. Start the virtual machine, and let Ubuntu install the rest of itself -- make sure you have an Internet connection (in Windows) before you try this, otherwise it will likely fail.

*Feel free to "man" any of these text editors, e.g. "man nano" or use Google to find tutorials.