Physics 5730/7730, Spring 2022 Homework #5

Due Monday April 11^{th}

1. Continuing the work started in **Lab 20**, complete the 2D collision simulation by:

   (a) Adding multiple elastic "particles" to the simulation. (About 20 is good.) It is fine if all particles have the same size and mass, but this is not required. Assign random initial positions and velocities to the particles.

   (b) Incorporating physically realistic collisions between the particles, in addition to the collisions between the particles and the walls.

   Your Python script **hw05a.py** should run standalone, and produce an approximately one-minute long animation called **hw05a.mp4**.

2. Using the Hamiltonian method described in class and used in **Lab 21**, create a 3-body simulator for Newtonian gravity and an animation of your results. You may confine the 3-bodies to two spatial dimensions. You are free to choose initial conditions so as to produce an interesting (to you!) animation. For example, you can start with a 2-body bound state and then scatter a third "free" body off of the bound state. Or you can start with three free bodies and try to get them to collide such that two remain bound. In general, three body motion (even in two dimensions) is chaotic and you may not always find what you expect.

   You should do this exercise in a standalone Python script **hw05b.py** which produces an animation called **hw05b.mp4**

Submit both your Python scripts and animations by 11:59 PM on Monday, April 11:

submit p5730 hw05 hw05a.py hw05a.mp4 hw05b.py hw05b.mp4