Project for Computational Physics Course

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1 Proposal

Sir,
I have chosen an interesting problem from your lecture note(5 th) to implement in this project.If you allow me to take this problem (This problem seems to me nontrivial) I will try my best to implement most parts of this problem.

- **Problem**
  Implement a leap-frog integration for the anharmonic oscillator

$$H = \frac{p^2}{2} + \frac{q^4}{4!} \tag{1}$$

  taking an ensemble of initial conditions; i.e., it should take a set of (staggered) initial phase space positions (pi , qi) where i running from 1 to N and a time step, h, and return the final phase space positions.
  Take N = 1000 different initial conditions distributed uniformly within the phase space volume with H less than equal to 1. Find the density of points within the phase space volumes with H less than equal to 1/4, 1/2 and 1. Evolve the systems using your program for trajectories of time duration 1, 2, 5 and 10 units. At the end of these times compute the same three phase space densities as initially. Are these conserved?