# PHY820 Homework Set 12

1. [5 pts] Goldstein, Problem 6-12.

2. [10 pts] For the system in problem 6-12 in Goldstein, determine the particle positions as a function of time, if, at $t = 0$, (a) the displacements and the velocity of the second particle are zero while the first particle moves at a velocity v, (b) the velocities and the displacement of the second particle are zero while the first particle is displaced by $+d$. (c) Find the general solution of the equations of motion if the particles get subjected to friction forces proportional to velocities, with a proportionality coefficient ν.

3. [5 pts] A mass m is suspended from a support by a spring with spring constant $m\,\omega_1^2$. A second mass m is suspended from the first by a spring with spring constant $m\,\omega_2^2$. A vertical harmonic force $F_0 \cos \omega t$ is applied to the upper mass. Find the steady-state motion for each mass. Examine what happens when $\omega = \omega_2$.
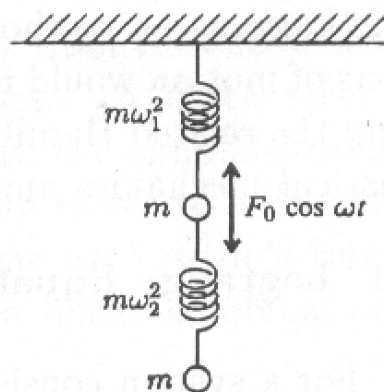
4. [10 pts] From a CM Final: Three beads of mass m, $2m$ and m, respectively, are threaded onto three parallel rods, a distance d apart from each other as shown. The beads are connected with springs characterized by a spring constant k. (Assume that the length of unstretched springs is zero.) The beads can move along the rods without friction. Find the normal modes of oscillation of the bead system (frequencies and amplitude vectors - no particular normalization required). Discuss those modes.