

Physics 21 Problem Set 6

Harry Nelson

due Monday, February 19, In Class

Course Info: The reading this week will be from Chapter 3, pages 112-133. We won't cover the topic of bodies that change their mass as a function of time.

The course web page is <http://hep.ucsb.edu/courses/ph21/>.

Prof. Nelson's office hours: Friday 2-2:50pm 5103 Broida, 4:10-5:30pm in Phelps 1508. Richard Eager's office hours are Monday 2:00-3:00pm, Tuesday 11:00-12:00noon, and Thursday 11:00-12:00noon in Broida 1019 (The Physics Study Room).

1. Consider a massless spring of length $\ell = 10$ cm and spring constant $k = 1$ N/m. You hang it vertically from the ceiling, and attach a mass m , with $m = 1$ gram, to the free end of the spring.
 - (a) You wait until the mass comes to rest. How long is the spring then? Denote by $\Delta\ell$ the *increase* in the length of the spring.
 - (b) Now imagine stretching the spring a little longer. To describe this, draw a clear picture of the extended spring. Set up your coordinate system so that y goes upward, but put $y = 0$ at the spot where the mass was at rest in part 1a. Make a free-body diagram showing the forces on the mass, and notice the sum of just two of the forces, the weight combined with $k\Delta\ell$. What is the *net* force on the mass, in terms of y ?
 - (c) You extend the mass to $y = -1$ cm, and release it from rest. At what y does it reach its maximum speed? How long does it take from the time of the release to reach the maximum speed? What is the value of the maximum speed?
 2. K&K Problem 2.31
 3. K&K Problem 3.1
 4. K&K Problem 3.4
 5. K&K Problem 3.8
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