Cornell University

Department of Physics

Phys 116 February 14, 2006

Mechanics and Special Relativity, Spring 2006

Homework Assignment # 4

(Due Wednesday, February 22, before the lecture.)

Lectures and Reading Assignments:

Readings are from *"An Introduction to Mechanics"* by Kleppner and Kolenkow.

- Lec 12, 2/17 (Fri): Spring Force, Hooke's Law, and Simple Harmonic Motion **Sec. 2.5 (pp. 97–101).**
- Lec 13, 2/20 (Mon): Momentum. Dynamics of a System of Particles. **Sec. 3.1, 3.2 (pp. 112–116).**
- Lec 14, 2/22 (Wed): Center of Mass **Sec. 3.2 (pp. 116–122).**

Problems:

Numbered problems are from *"An Introduction to Mechanics"* by Kleppner and Kolenkow, Chapter 2 (pp. 103–109).

1. Usually, the effect of friction is to decrease the speed of moving objects. Are there situations in which friction *increases* the speed? If yes, give an example. If no, explain why not.
2. Problem 2.31
3. Problem 2.28
4. Problem 2.21
5. Problem 2.23 (Hint: divide the string into small "chunks" – recall the capstan example in lecture and study Examples 2.12, 2.13 in the book.)
6. Problem 2.26
7. Problem 2.34 (Before you start, study Example 2.7 on p. 76 of the book. Hint: a differential equation of the form
$$\frac{df}{dx} = \frac{a}{b+x}\, f \tag{1}$$
is solved by
$$f = C\,(b+x)^a \tag{2}$$
where C is an integration constant which has to be determined from the initial conditions.)