Cornell University

Department of Physics

Phys 116 March 8, 2006

Mechanics and Special Relativity, Spring 2006

Homework Assignment # 6

(Due Wednesday, March 15, before the lecture.)

Lectures and Reading Assignments:

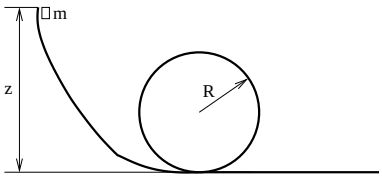
Readings are from *"An Introduction to Mechanics"* by Kleppner and Kolenkow.

- Lec 21, 3/10 (Fri): Conservative Forces and Potential Energy. **Sec. 4.7–4.8 (pp. 168–173).**
- Lec 22, 3/13 (Mon): Energy Diagrams. Stability and Small Oscillations. **Sec. 4.8–4.10 (pp. 174–182).**
- Lec 23, 3/15 (Wed): Nonconservative Forces. Power. **Sec. 4.11–4.13 (pp. 182–187).**

Problems:

Numbered problems are from *"An Introduction to Mechanics"* by Kleppner and Kolenkow, Chapter 4 (pp. 194–200).

1. A person of mass m jumps with a forward velocity of v_0 onto a stationary cart of mass M. The cart then rolls on a frictionless horizontal surface for a distance d at which point it reaches a hill that rises at an angle α. Find the total distance travelled by the cart at the point at which the cart attains its maximum height up the hill.
2. A small block of mass m starts from rest and slides along a frictionless loop-the-loop of radius R, as shown in the figure below. Find the initial height z required for the block to complete the loop.



3. Problem 4.3
4. Problem 4.4
5. Problem 4.7
6. A ball of mass m is thrown vertically upward from the ground with the initial velocity v_0. The ball is subject to a viscous force (air drag) which is proportional to its speed, $\mathbf{F}_{\text{visc}} = -\beta\mathbf{v}$. Find the amount of work done by the viscous force on the ball on its way up.

   Hint: Changing the integration variable in the work formula from x to t might help.