Classical Mechanics - PHYS 310 - Fall 2013 HW # 3
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Please return it by the 13th of September 2013

- **Problem 1**

  A child slides a block of mass 2 kg along a slick kitchen floor. If the initial speed is $4m/s$ and the block hits a spring with spring constant $6N/m$,what is the maximum compression of the spring? What is the result if the block slides across $2m$ of a rough floor that has $\mu_k = 0.2$?

  10 points

- **Problem 2** A Block of mass $m = 1.62kg$ slides down a frictionless incline. The block is released from a height $h = 3.91m$ above the bottom of the loop.
  (a) What is the force of the inclined block at the bottom (point A)?
  (b) What is the force of the track on the block at point B?
  (c) At what speed does the block leave the track?
  (d) How far away from point A does the block land on level ground?
  (e) Sketch the potential energy U(x) of the block. Indicate the total energy on the sketch?

  15 points

- **Problem 3 - Use Mathematica for Plotting** A particle of mass $m = 1kg$ is subjected to a one-dimensional force $F(t) = kte^{-\alpha t}$, where $k = 1N/s$, and $\alpha = 0.5s^{-1}$.If the particle is initially at rest, calculate and plot with the aid of a computer program, the position,speed , acceleration of the particle as a function of time.

  20 points

- **Problem 4** A particle is released from rest (y=0) and falls under the influence of gravity and air resistance. Find the relationship between v and the distance of falling, y when the air resistance is equal to
  (a) αv
  (b) βv^2

  15 points