

Classical Mechanics - PHYS 310 - Fall 2013 HW # 6
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Please return it by the 04th of September 2013

- **Problem 1** A planet of density ρ_1 (spherical core, radius R_1) with a thick spherical cloud of dust (density ρ_2 , radius R_2) is discovered. What is the force on the particle of mass m placed within the cloud?

15 points

- **Problem 2**

Calculate the gravitational potential due to a thin rod of length l and mass M at a distance R from the center of the rod and in a direction perpendicular to the rod.

15 points

- **Problem 3**

A particle is dropped in to a hole drilled straight through the center of earth. Neglecting rotational effects, show that the particle's motion is simple harmonic if you assume earth has uniform density. Show that the period of oscillation is 84 min.

15 points

- **Problem 4**

Assuming that the air resistance is not important, calculate the minimum velocity a particle must have at the surface of Earth to escape from Earth's gravitational field. Obtain a numerical value for this result. Do you know what is this velocity called?

15 points