

Physics 501: Classical Mechanics

Read: LL 11-19; JS 4.1

Problems with stars are not for credit and will NOT be graded.

Homework 4

Exercise 1

How long would it take for the Moon to fall on the Earth if she suddenly lost its kinetic energy? Solve the problem without calculating any integrals.

Hint: Compare the circular orbit of the Moon with the (degenerate) elliptic orbit of the Moon falling on the Earth using the third Kepler's law.

Exercise 2

A comet is moving towards the Sun from far away with an impact parameter b and energy E . Find the perihelion of the orbit and the velocity of the comet at the perihelion.

Exercise 3

Find the differential scattering cross section of hard spheres of radii a scattered by an infinitely massive hard sphere of the radius R . Calculate the total cross section by integrating the differential one.

Exercise 4

Calculate the differential scattering cross section of particles of the energy E scattered by the central force potential $U(r) = -\frac{\alpha}{r} + \frac{\beta}{r^2}$ (α and β are positive constants).