PHYS 5310
CLASSICAL MECHANICS - 2023

HOMEWORK 4

Exercise 1.
Find the relation between the angles θ_1 and θ_2 (in the L -laboratory- system) after a disintegration of one particle into two new ones.

Exercise 2.
Find the angular distribution of the resulting particles from the disintegration discussed in Exercise 1, in the L system.

Exercise 3.
A collision occurs between a moving particle m_1 and a second particle m_2 at rest. Find the velocity of each of them afterwards in terms of their directions of motion in the L system.

Exercise 4.
Determine the effective cross section for scattering of particles from a perfectly rigid sphere of radius a. Notice that this is equivalent to $U = \infty$ for $r < a$ and $U = 0$ for $r > a$.

Exercise 5.
Express the effective cross section from Exercise 4 as a function of the energy ϵ lost by a scattered particle.

Exercise 6.
Find the effective cross section as a function of the velocity v_∞ for particles scattered in a field $U = \alpha r^{-n}$.

Exercise 7.
Find the effective cross-section for scattering in a field $U = \alpha/r^2$ with $\alpha > 0$.