

PHYS 5310
CLASSICAL MECHANICS - 2024

HOMEWORK 5

Exercise 1.

Show that formula (7) in Lesson 5 is the correct value for the angle θ in terms of the velocities V , v_o and the angle θ_o .

Exercise 2.

Show that formula (7) can be written as a quadratic formula for $\cos \theta_o$ and solve it in terms of V , v_o and the angle θ .

Exercise 3.

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 4.

Find the angular distribution of the resulting particles from the disintegration discussed in the previous Exercise (Ex 3), in the L system.

Exercise 5.

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 6.

Show that formula (17) from Lesson 5 when using definitions (18) becomes formula (19).

Exercise 7.

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 8.

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

Exercise 9.

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