

MASSACHUSETTS INSTITUTE OF TECHNOLOGY

6.5160J, 8.351J, 12.620J

Classical Mechanics: A Computational Approach

Problem Set 4—Fall 2024

Issued: 25 September 2024

Due: 4 October 2024

Note: Project 2 is due on Friday, 11 October 2024

Reading: SICM2 Chapter 2 through section 2.7

Introduction

An important application of the Lagrangian method of mechanics is the motion of rigid bodies. There are no rigid bodies, but we often can approximate actual objects as a multitude of massive components linked by rods that can be modeled as coordinate constraints. In this approximation an amazing result is that for a free body any complex mass distribution can be summarized in only three numbers: the principal moments of inertia, and the motion can be summarized by the velocity of translation and an angular velocity. The orientation is specified by generalized coordinates, such as the Euler angles.

Exercises

- Exercise 2.2: Steiner's theorem. SICM2 page 129
- Exercise 2.3, parts a & b: Useful moments. SICM2 page 129
- Exercise 2.4: Jupiter. SICM2 page 129
- Exercise 2.6: Principal Moments. SICM2 page 134
- Exercise 2.9: Euler Angles. SICM2 page 138