

PHY5246

Theoretical Dynamics

Problem Set 9

Due: Monday, Nov 13, 2006

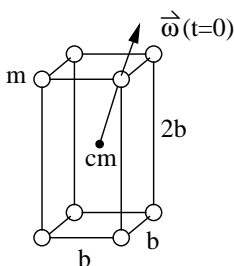
9.1 Problem 7, GPS, Chapter 5, Pg. 234.

9.2 Problem 19, GPS, Chapter 5, Pg. 235.

9.3 Problem 22, GPS, Chapter 5, Pg. 236.

9.4 Problem 26, GPS, Chapter 5. Pg. 236.

9.5 (From the Spring 2001 Comprehensive Exam.) An idealized rigid body consists of eight equal masses m at the corners of a rectangular wire frame (with negligible mass) with sides b , b , and $2b$. At $t = 0$ the body is rotating with angular velocity $\omega = |\vec{\omega}|$ about an axis which passes through the center of mass and a corner, and the subsequent motion is force free.



- Find the principal moments of inertia of the body. Which principal axis is the symmetry axis of the body?
- Find the angular momentum of the body at $t = 0$ in the body coordinate system, and show that at *any* later time t it lies in the same plane as $\vec{\omega}$ and the principal axis which is the symmetry axis of the body.
- Use Euler's equations to find $\vec{\omega}$ in the body coordinate system at all later times t . At what frequency does $\vec{\omega}$ precess around the symmetry axis of the body?