

Name: _____

Student #: _____

Applications of Classical Mechanics
Physics 350 2011W
Challenge Problem: Monday, March 25, 2019

Concept Check:

- (a) [T/F] ____ : For a rigid body, angular momentum always points in the direction of angular velocity.
 - (b) [T/F] ____ : Mass is the constant of proportionality between momentum and velocity, and the inertia tensor plays the same role for angular momentum and angular velocity. However, the inertia tensor is, in a general coordinate system, not constant.
 - (c) [T/F] ____ : For a body with an axis of symmetry two of the principal moments must be equal, the axis of symmetry is one of the principal axes and the other two principal axes can be chosen to be any two directions in the plane perpendicular to the axis of symmetry.
 - (d) [T/F] ____ : Any conservative mechanical system can be linearized about a stable equilibrium point. The linearized motion will be a superposition of harmonic motion at the eigenfrequencies characteristic of the system.
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Problem: Moments of a Symmetric Body

- (a) What are the Principal Moments of a Body? What are the Principal Axes of a Body?
 - (b) Suppose a body has one axis of cylindrical symmetry. What does this imply about the principal moments of this body? What does this imply about the principal axes of this body?
 - (c) What are the Euler angles? Describe the 3 rotations needed to define them and the axes that define these 3 rotations.
 - (d) Write down the angular velocity in terms of the Euler angles.
 - (e) Write down the Kinetic Energy and Lagrangian of a Symmetric Body
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