PHY3110 Homework Assignment 7

1. (20 points) Derive Euler's equations from the Lagrange equations of motion.

2. (25 points) A uniform rectangular block has mass M and sides $2a$, $2b$ and $2c$. Find the principal moments of inertia of the block
i) at its center of mass,
ii) at the center of a face of area $4ab$.
Find the moment of inertia of the block
i) about a space diagonal,
ii) about a diagonal of a face of area $4ab$.

3. 2. (20 points) Consider the torque-free motion of an asymmetric rigid body with one point fixed, show from Euler equations that L^2 and T (L and T are the angular momentum and kinetic energy) are conserved.

4. (35 points) For the axially symmetric rigid body precessing uniformly in the absence of torques, find analytical solutions for the Euler angles as a function of time.