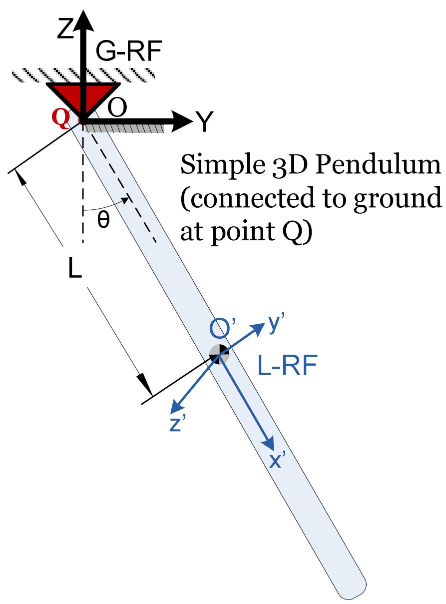
Assignment 8: Due March 18, 2010.

Problem 1. Prove that the double integral that shows up in the expression of the virtual work is zero.

Problem 2. Prove that $\dot{\bar{\omega}} = 2\mathbf{G}\ddot{\mathbf{p}}$. Hint: start with $\bar{\omega} = 2\mathbf{G}\dot{\mathbf{p}}$, take a time derivative and show that $\dot{\mathbf{G}}\dot{\mathbf{p}} = \mathbf{0}_3$. This last step is brute force.



Problem 3. This problem builds on Problem 2 of Assignment 7. The schematic of the mechanism is shown in the figure. The rigid body is subjected to a motion specified as $\theta(t) = \frac{\pi}{4}\sin(2t)$.

You will have to carry out a Kinematics Analysis for the mechanism for 10 seconds of its evolution. To this end, use a time grid with time steps of $\Delta t = 10^{-3}$. In the folder solution, include a movie of the time evolution of this mechanism, along with six plots. The first three will display the location of point O' in the G-RF as a function of time, the second one its velocity in the G-RF as a function of time, and the third one will display its acceleration in the G-RF. The last set of three plots will display to same information for the tip of the pendulum located at Q. When you return the handwritten component of this homework please include an explanation of the results that you obtain for point Q.

NOTE: USE THE $\bar{\omega}$ APPROACH TO FORMULATE THE VELOCITY AND ACCELERATION PROBLEMS.