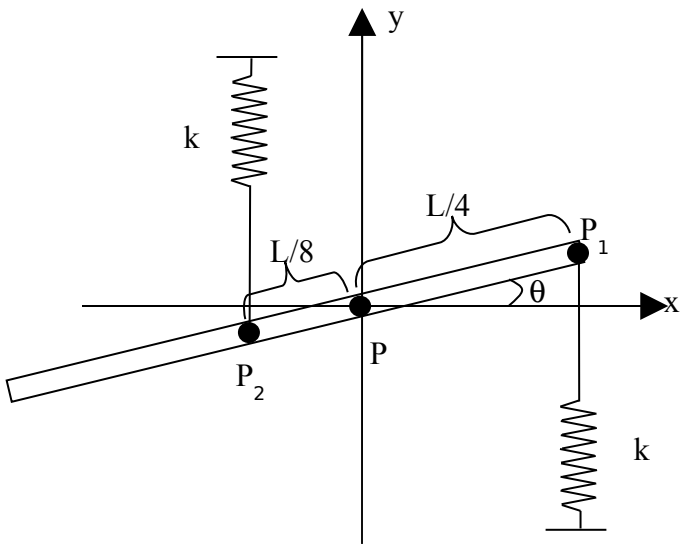
A thin, uniform rod of length L and mass M is pivoted about an axis through point P at its center and perpendicular to the xy plane as shown in figure below. Two ideal springs with spring constants k are attached to the rod from the points P_1 and P_2. Both of the springs are at equilibrium when the rod is aligned along the x-axis ($\theta = 0$ *rad).* ($I_{cm}=ML^2/12$ for a thin, uniform rod of length L and mass M)



(a) (8 pts) Consider that the rod is at an angle θ with respect to the x-axis. What is the net torque about the rotation axis ($\sum \tau_z = ?$) ? Express your answer as a function of θ , k, M, and L.

(b) (8 pts) For very small θ , the rod will undergo oscillations around the equilibrium point. Find out the frequency of the oscillations as a function of θ , k, M, and L?

(c) (9 pts) Consider that the maximum angular displacement during the oscillations is π */10 rad*. Find out the magnitudes of the tangential and radial components of acceleration (a_{tan}, a_{rad}) at point P_2 for $\theta = 0$ *rad* and $\theta = \pi/10$ *rad*. Express your answers as functions of k, M, and L.