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MICHIGAN STATE UNIVERSITY

PHY422/820: Classical Mechanics

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Midterm #2 Preparation

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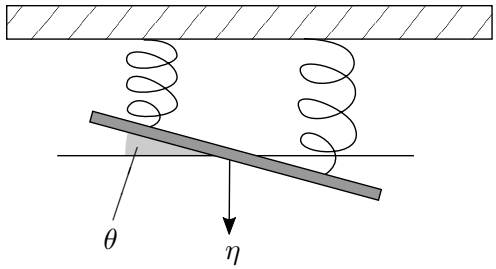
Problem P3 – Suspended Rod

A very thin uniform rod of length l and mass m ($I = ml^2/12$) hangs from two ideal springs with constants k. The coordinate η is the vertical displacement of the rod's center from its equilibrium position. The displacement of the rod ends are $\eta_1 = -l/2 \sin\theta$ and $\eta_2 = l/2 \sin\theta$. Consider only the vertical motion of the rod-spring system and assume small displacements.



Construct the Lagrangian in terms of η and θ and determine the normal modes.