A bead slides on a circular wire loop in a constant gravitational field. The loop is constrained to rotate about its diameter which is located along the z-axis. The loop is forced to rotate about the diameter with a constant angular velocity  $\omega$ .

Use the method of Lagrange undetermined multipliers to obtain an equation of motion for the polar angle  $\theta$  and equations for the forces of constraint in terms of  $\theta$  and  $\dot{\theta}$ .