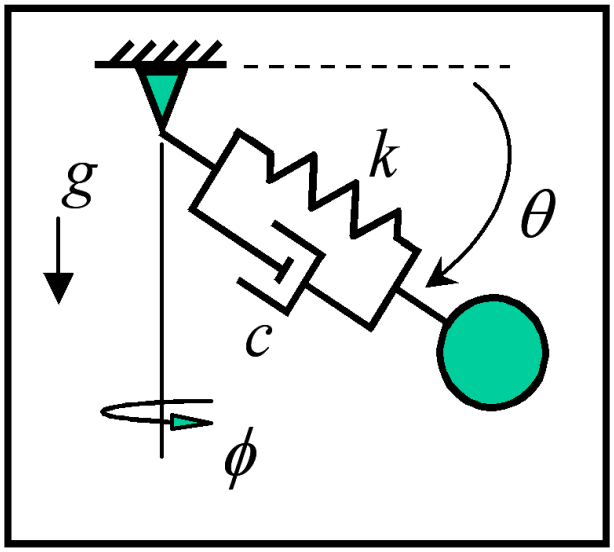
16.61 Handout #6
Prof. J. P. How March 20, 2003
Prof. J. Deyst **Due:** April 3, 2003

16.61 Homework Assignment #6

1. Consider a spherical pendulum with a spring and damper connected in parallel. In the figure, $\dot{\phi}$ is positive *up* the page, $\dot{\theta}$ is positive going into the page. Using spherical coordinates r, θ, ϕ derive the equations of motion for the mass. For the initial conditions listed, describe the motion of the pendulum after a long time. (Neglect air resistance.)

$$r_0 = L,\ \dot{r}_0 = \dot{L},\ \theta_0 = \frac{3\pi}{4},\ \dot{\theta}_0 = 0,\ \phi_0 = 0,\ \dot{\phi}_0 = 0$$



2. Do problem 2.6 on page 63 of Greenwood's *Principles of Dynamics*

3. Consider the 2D system shown in the figure. The pivot point for the pendulum supporting the mass m is attached to the wheel that is rotating about a fixed point at a constant rate ω. Find the equations of motion of the system and show that when $\omega = 0$ you recover the expected equations of motion for the pendulum.