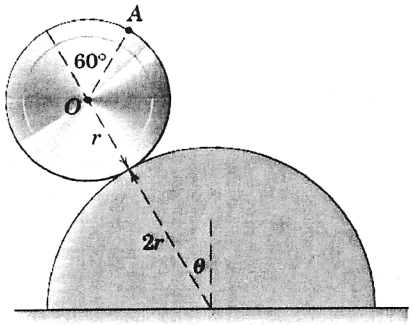
Department of Mechanical Engineering
University of California at Berkeley
ME 104 Engineering Mechanics II
Spring Semester 2014

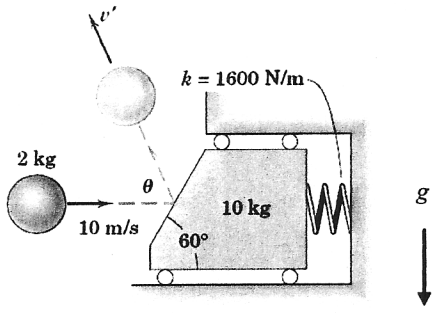
Midterm Examination No. 2 Apr 4, 2014

The examination has a duration of 50 minutes.
Answer all questions.
All questions carry the same weight.

1. The small cylinder rolls on the surface of a large cylinder without slipping. By using the instantaneous center of zero velocity of the small cylinder, determine the velocity v_A of point A shown where $\theta = 30°$ and is increasing at the rate $\dot{\theta}$.



2. A 2-kg sphere is projected horizontally with a velocity of 10 m/s against the 10-kg carriage which is backed up by a spring with stiffness of 1600 N/m. The carriage is initially at rest with the spring uncompressed. If the coefficient of restitution is 0.6, calculate the rebound velocity v', the rebound angle θ, and the maximum travel δ of the carriage after impact.



3. The wheel shown rolls without slipping on the horizontal surface. At the instant shown, it has an angular velocity of $\dot{\theta}_d$ and an angular acceleration of $\ddot{\theta}_d$.
   a) For the numerical values of the constants as given with $\dot{\theta}_d$ = -6 rad/sec and $\ddot{\theta}_d$ = -2 rad/sec^2, determine $\dot{\theta}_1$ and $\dot{\theta}_2$ (50%)
   b) For the numerical values of the constants given and the previously determined values of $\dot{\theta}_1$ and $\dot{\theta}_2$, determine $\ddot{\theta}_1$ and $\ddot{\theta}_2$. (50%)