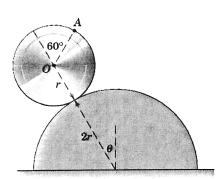
## Department of Mechanical Engineering University of California at Berkeley ME 104 Engineering Mechanics II Spring Semester 2014

## Midterm Examination No. 2

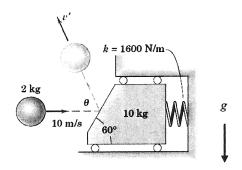
Apr 4, 2014

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  $\theta = 30^{\circ}$  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  $\theta$ , and the maximum travel  $\delta$  of the carriage after impact.



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- 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  $\dot{\theta_d}$ .
  - a) For the numerical values of the constants as given with  $\theta_d = -6$  rad/sec and  $\theta_d = -2$ rad/sec<sup>2</sup>, 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%)

