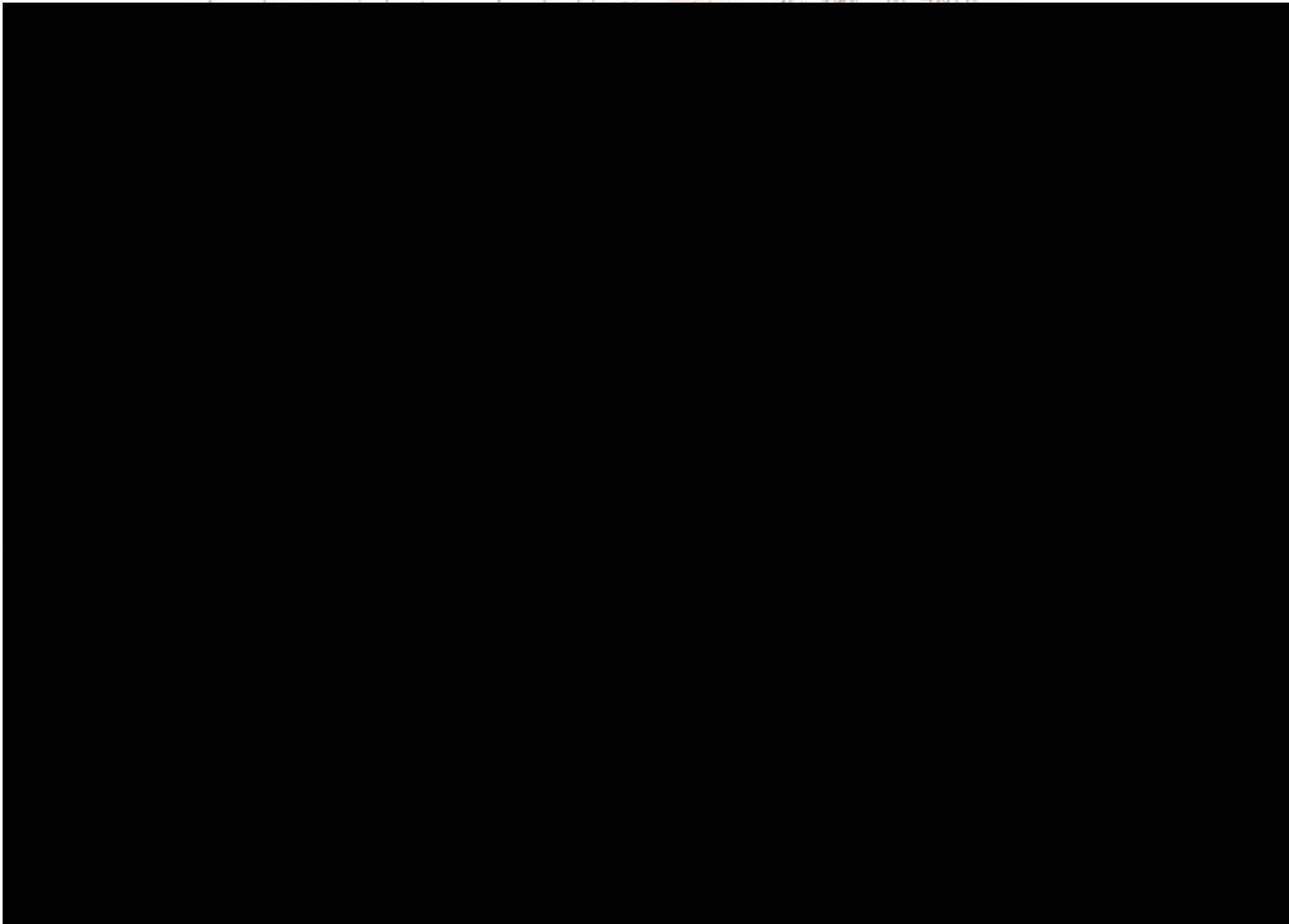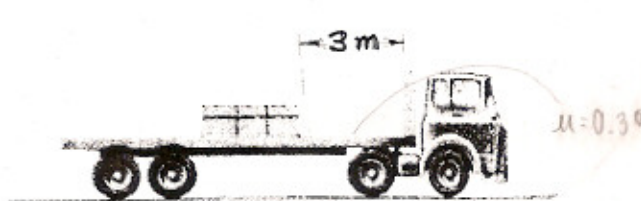Name Helen Chiu

**ME104 Section 1  Fall'07   Midterm Exam #1.**
**Closed book and notes, one formula sheet supplied, 80 minutes**

1. The coefficient of static friction between the flat bed of the truck and the crate it carries is 0.30.  Determine the minimum stopping distance s that the truck can have from a speed of 70 km/h with constant deceleration if the crate is not to slip forward.



$\mu = 0.30$

2. The 3-lb ball is given an initial velocity $v_A = 8$ ft/sec in the vertical plane at position A, where the two horizontal attached springs are unstretched. The ball follows the dotted path shown and crosses point B which is 5 in. directly below A. Calculate the velocity $v_B$. Each spring has a stiffness of 10 lb/in.
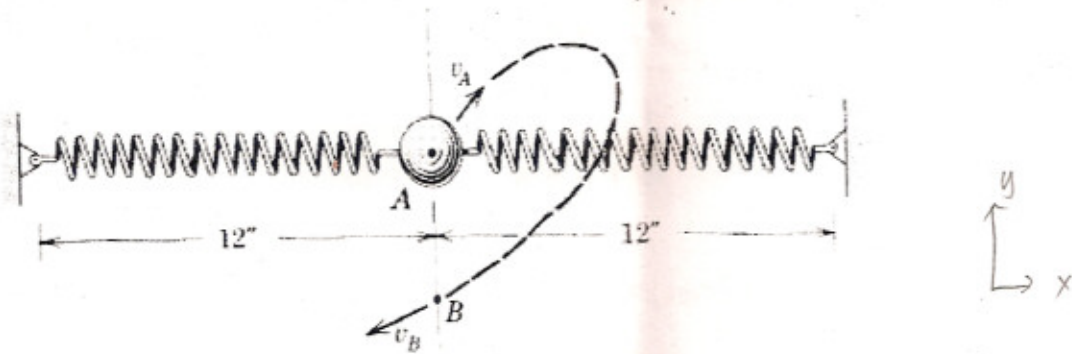
Name **Helen Chow**

**3. Careful measurements made during the impact of the 200-g metal cylinder with the spring-loaded plate reveal a semi-elliptical relation between the contact force F and the time t of impact as shown. Determine the rebound velocity v of the cylinder if it strikes the plate with a velocity of 6 m/s.**

6 m/s

200 g

v
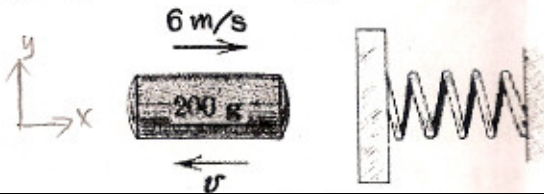
Name Helen Chow

**4.** A small mass particle is given an initial velocity $v_0$ tangent to the horizontal rim of a smooth hemispherical bowl at a radius $r_0$ from the vertical centerline, as shown at point A. As the particle slides past point B, a distance h below A and a distance r from the vertical centerline, its velocity v makes an angle $\theta$ with the horizontal tangent to the bowl through B.

a). Is the vector angular momentum conserved? Show why.

b) Determine $\theta$.