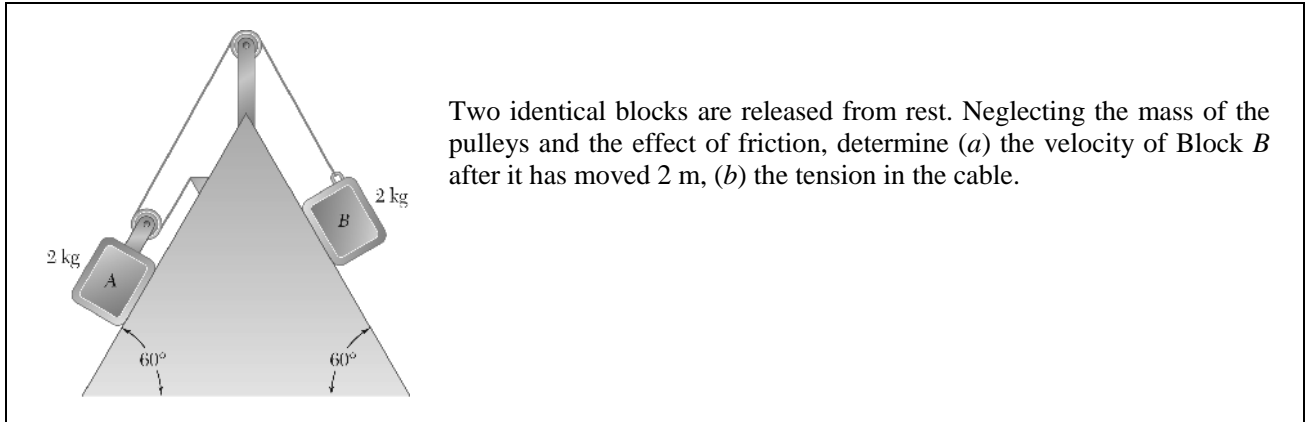


# **ME 104: Homework 5**

**Prof. Karl Hedrick: University of California, Berkeley**

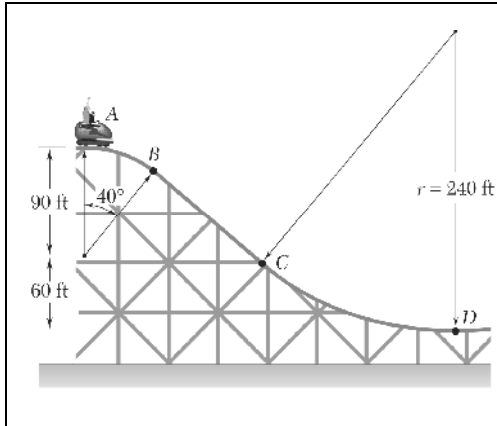
**Due Friday, Oct. 16th, 5pm**

### Chapter 13, Problem 19



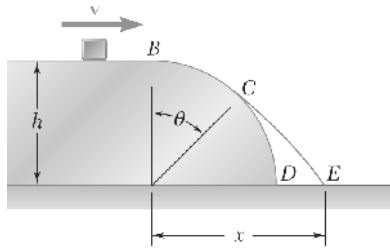
Two identical blocks are released from rest. Neglecting the mass of the pulleys and the effect of friction, determine (a) the velocity of Block *B* after it has moved 2 m, (b) the tension in the cable.

### Chapter 13, Problem 41



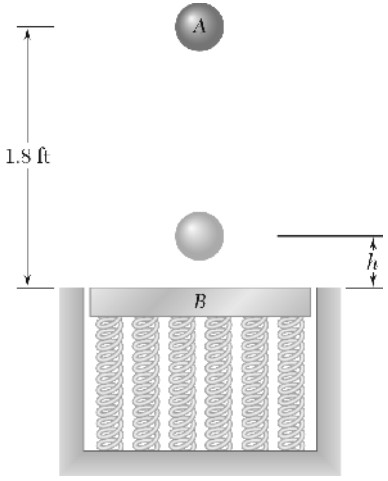
A section of track for a roller coaster consists of two circular arcs  $AB$  and  $CD$  joined by a straight portion  $BC$ . The radius of  $AB$  is 90 ft and the radius of  $CD$  is 240 ft. The car and its occupants, of total weight 560 lb, reach Point  $A$  with practically no velocity and then drop freely along the track. Determine the normal force exerted by the track on the car as the car reaches Point  $B$ . Ignore air resistance and rolling resistance.

### Chapter 13, Problem 44



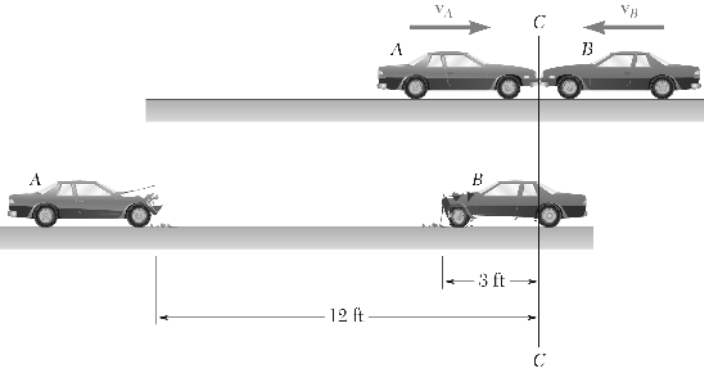
A small block slides at a speed  $v = 8$  ft/s on a horizontal surface at a height  $h = 3$  ft above the ground. Determine (a) the angle  $\theta$  at which it will leave the cylindrical surface  $BCD$ , (b) the distance  $x$  at which it will hit the ground. Neglect friction and air resistance.

### Chapter 13, Problem 178



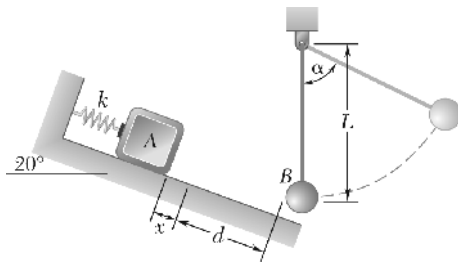
A 1.3-lb sphere  $A$  is dropped from a height of 1.8 ft onto a 2.6-lb plate  $B$ , which is supported by a nested set of springs and is initially at rest. Knowing that the coefficient of restitution between the sphere and the plate is  $e = 0.8$ , determine (a) the height  $h$  reached by the sphere after rebound, (b) the constant  $k$  of the single spring equivalent to the given set if the maximum deflection of the plate is observed to be equal to  $3h$ .

### Chapter 13, Problem 180



Two cars of the same mass run head-on into each other at  $C$ . After the collision, the cars skid with their brakes locked and come to a stop in the positions shown in the lower part of the figure. Knowing that the speed of car  $A$  just before impact was 5 mi/h and that the coefficient of kinetic friction between the pavement and the tires of both cars is 0.30, determine (a) the speed of car  $B$  just before impact, (b) the effective coefficient of restitution between the two cars.

**Chapter 13, Problem 201**



The diagram shows a 20° inclined plane. A block labeled 'A' is positioned on the incline, pushed against a spring with spring constant 'k'. The spring is compressed by a distance 'x'. The distance from the unstretched position of the spring to the point where the block strikes a sphere 'B' is labeled 'd'. Sphere 'B' is suspended from a pivot point by a rope of length 'l'. The rope is initially at an angle 'α' to the vertical. A dashed arc indicates the path of the sphere as it swings.

A 2-kg block  $A$  is pushed up against a spring compressing it a distance  $x = 0.1$  m. The block is then released from rest and slides down the  $20^\circ$  incline until it strikes a 1-kg sphere  $B$ , which is suspended from a 1 m inextensible rope. The spring constant  $k = 800$  N/m, the coefficient of friction between  $A$  and the ground is 0.2, the distance  $A$  slides from the unstretched length of the spring  $d = 1.5$  m and the coefficient of restitution between  $A$  and  $B$  is 0.8. When  $\alpha = 40^\circ$ , determine (a) the speed of  $B$  (b) the tension in the rope.