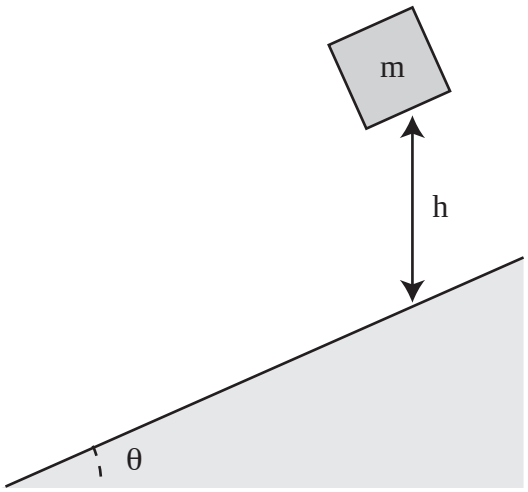
Homework #6

Due Friday, Mar. 18

1. You are a police officer charged with determining the speeds of two cars involved in a collision. A Cadillac of mass 1800 kg collided with a Toyota of mass 1300 kg at right angles in an intersection. Witnesses report that the cars stuck together after the collision, and the combined wreck left skid marks of length 3.4 m leading to the place where the wreck came to rest. The skid marks make an angle of 33° from the initial direction of the Cadillac. The coefficient of friction between the road and the car tires is $\mu_k = 0.38$. Find the speed of both cars just before the collision.

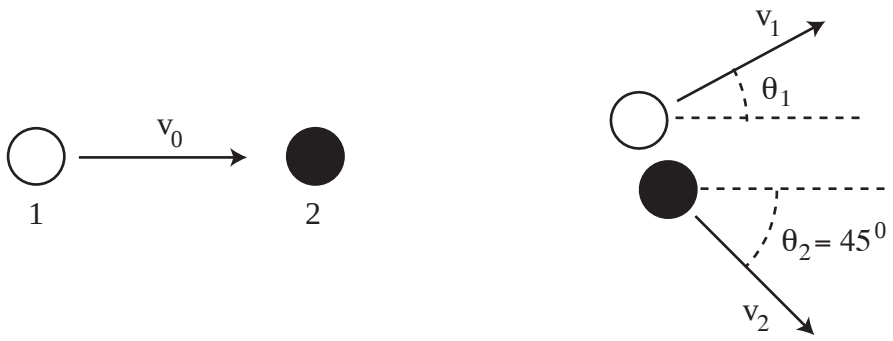
2. A block of mass $m = 0.34$ kg is dropped from rest onto a frictionless slope with $\theta = 20°$ from a vertical height $h = 0.84$ m, as shown below. Find the speed of the block just before and just after it hits the slope.



3. Chapter 7, problem 14

4. Chapter 7, problem 38

5. Balls 1 and 2 (with unequal masses) are on a table. Ball 2 is initially at rest, while ball 1 is moving toward ball 2 with speed 1.4 m/s. After they collide, the balls move away with speeds v_1 and v_2 at angles θ_1 and θ_2, as shown below. Find the minumum value of v_1 if $\theta_2 = 45°$.



6. Sand is being dumped from a stationary hopper onto a cart at a steady rate of 1.2 kg/s while the cart rolls without friction on a horizontal surface. At a certain instant, the mass of the cart plus the sand on the cart is 21 kg, and the cart is moving at a speed of 0.54 m/s. What is the acceleration of the cart at this instant? Qualtitatively, how does the acceleration change at later times?