PHY 211 Exam 3: Problem 3

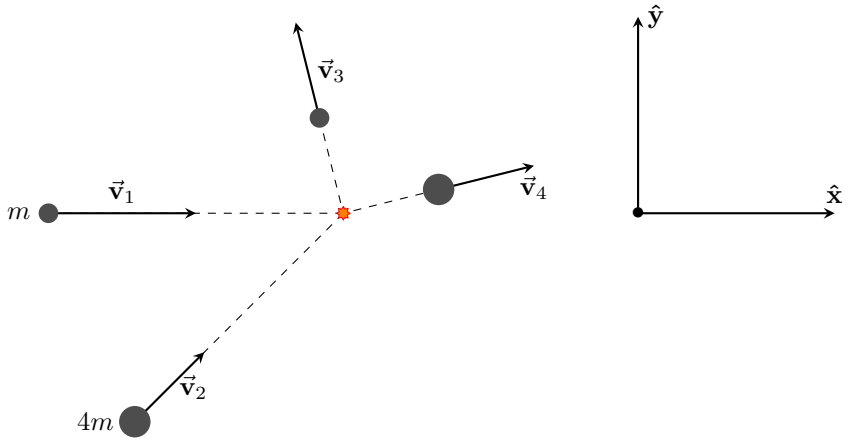
April 7, 2020

This is only one of the exam problems. You must read the full instructions on problem 1 before starting the exam.

Instructions: Solve this problem and submit it to Blackboard before 1 PM Syracuse time (Eastern Daylight Time) on Wednesday, April 8. You will submit all four problems as separate submissions to help us grade more efficiently.

Problem 3

A large marble with a mass of $4m$ (four times a regular marble) is rolling across the floor in front of you, but you aren't sure with exactly what velocity. Carefully timing your throw, you shoot a smaller marble of mass m with a speed $v_1 = 7\,\mathrm{m/s}$ at it; define the x-direction as the direction of your throw. The two marbles then collide. Afterwards you measure the velocities of the two marbles: the smaller one has a velocity $\vec{\mathbf{v}}_3 = -1\,\hat{\mathbf{i}} + 4\,\hat{\mathbf{j}}\,\mathrm{m/s}$, and the larger one $\vec{\mathbf{v}}_4 = 4\,\hat{\mathbf{i}} + 1\,\hat{\mathbf{j}}\,\mathrm{m/s}$. You can ignore any effects of rolling in this problem, including friction.



(a) (20 points)**.** What was the velocity of the larger marble before the collision?

(b) (5 points)**.** Was energy conserved in the collision? Be sure to answer fully (not just yes or no).