Due Date: March 22

Aaron G. Kebede
Grade 11 Physics
March 26, 2022

Week of March 14 Homework

Read the sections on the syllabus for the week before attempting the problems. The problems are due on Tuesday, March 22. **No late submissions are accepted**.

Question 1. Write down an explanation for the following concepts related to dynamics.

1) What is collision? Why is linear momentum usually brought up along with collisions?
2) What is impulse? How is it related to linear momentum?
3) An object that has a small mass and an object that has a large mass have the same momentum. Which object has the largest kinetic energy? An object that has a small mass and an object that has a large mass have the same kinetic energy. Which mass has the largest momentum?
4) How can a small force impart the same momentum to an object as a large force?(Think of the soccer problem we had in class.)
5) Must the total energy of a system be conserved whenever its momentum is conserved? Explain why or why not.
6) Can objects in a system have momentum while the momentum of the system is zero? Explain your answer.
7) What is an inelastic collision? What is a perfectly inelastic collision?

Question 2. A car moving at 10m/s crashes into a tree and stops in 0.26 s. Calculate the force the seat belt exerts on a passenger in the car to bring him to a halt. The mass of the passenger is 70 kg.

Question 3. Two identical objects (such as pool balls) have a one-dimensional head-on collision in which one is initially motionless. After the collision, the moving object is stationary and the other moves with the same speed as the other originally had. Show that both momentum and kinetic energy are conserved.

Question 4. The mass of Earth is $5.972\text{x}10^{24} kg$ and its orbital radius is an average of $1.496\text{x}10^{11} m$. Calculate its linear momentum.

4.1. Tough Problems

You can do the following problem, but you don't have to. It is extra credit.

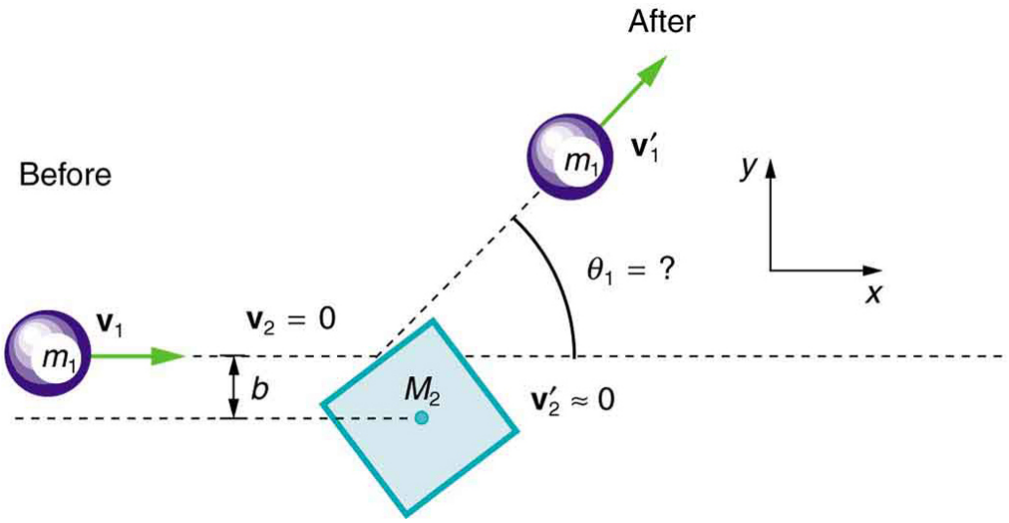

Figure 1. Point Masses Colliding

Question 5. Figure 1 shows a cube at rest and a small object heading toward it. (a) Describe the directions (angle θ_1) at which the small object can emerge after colliding **elastically** with the cube. How does θ_1 depend on b , the so-called impact parameter? Ignore any effects that might be due to rotation after the collision, and assume that the cube is much more massive than the small object. (b) Answer the same questions if the small object instead collides with a massive sphere.

SHOW ALL NECESSARY WORK TO RECEIVE FULL CREDIT