Momentum and Collisions—Practice Problems

Show all your work for each part of each problem on a separate sheet of paper.

1. The momentum of a ball increased by 12.0 N s as a result of a force that acted on the ball for 2.00 s. What was the average force on the ball?
2. A 0.150 kg ball moving horizontally at 3.00 m s^{-1} collides perpendicularly with a vertical wall and bounces back with the same speed.
    a. What is the impulse delivered to the ball?
    b. If the ball was in contact with the wall for 0.125 s, find the average force exerted by the ball on the wall.
3. A ball with a mass of *2m* is moving to the right at a velocity of *0.5v*. A second ball, with a mass of *m*, is traveling to the left at a velocity of *v*. When they collide head-on, the two balls stick together. With what velocity will they travel together after the collision?
4. Two masses of 2.00 kg and 4.00 kg are kept stationary on a frictionless horizontal table with a compressed spring between them. If the masses are released, the larger mass moves away with a velocity of 3.50 m s^{-1}. What is the velocity of the other mass?
5. A 70.0 kg person stands at the back of a 200.0 kg boat of length 4.00 m that is floating on stationary water. She begins to walk toward the front of the boat. When she gets to the front, how far back with the boat have moved relative to the water?
6. a. A fan on a floating barge blows air at high speed toward the right. Will the barge move? Explain your answer
    b. A sail is now put up on the barge so that the fan blows air toward the sail. Will the barge move? Explain your answer.
7. Two masses moving in a straight line toward each other collide. Immediately before the collision, the mass moving to the left (m = 12.0 kg) had a velocity of 2.0 m/s, and the mass moving to the right (m = 4.0 kg) had a velocity of 24.0 m/s. Immediately after the collision, the 4.0 kg ball is moving to the left with a velocity of 3.0 m/s. What is the velocity of the other mass?
8. Describe how you can determine the final velocity of an object from data on a force-time graph (assume that the initial velocity and the object's mass are both known).