Momentum (1D)

1. Two objects A & B, have identical velocities. Object A has 3 times the mass of object B. Compare the momentum of each.

2. Two objects C & D, have identical masses. Object C has twice the velocity of object D. Compare the momentum of each.

3. While being thrown, a net force of 132 N acts on a baseball (m=140g) for a period of 4.5E-2 seconds.
   a. What is the magnitude of the change in momentum of the ball? 
   b. If the initial speed of the baseball was 0m/s, what will its speed be the moment it leaves the pitcher’s hand?
   c. When the batter hits the ball (assuming it is the same speed as when it left the pitcher’s hand), a net force of 1120 N, opposite the direction of the ball’s initial motion, acts on the ball for 9E-3 seconds during the hit. What is the final velocity of the ball just after it leaves the bat?
   d. What force does the ball exert on the bat?

4. A rocket, weighing 4.36E4 N, has an engine which provides an upward thrusting force of 8.9E5 N. It reaches a maximum speed of 860 m/s.
   a. Draw a force diagram of the rocket.
   b. For what period of time after launch must the engine burn to reach this speed?
   c. A golf ball has a weight of 0.45 N and is dropped from a height of 1 meter. Assume that the golf ball has an elastic collision with the floor (speed it hits will be the speed it bounces up with).
   a. Determine the time required for the ball to reach the floor.
   b. What will the instantaneous momentum be just before it strikes the floor?
   c. What will its change in momentum be from just before it strikes the floor to just after it rebounds from the floor?
   d. Suppose that the golf ball was in contact with the floor for 4E-4 seconds. What was the average force on the ball while it was in contact with the floor?