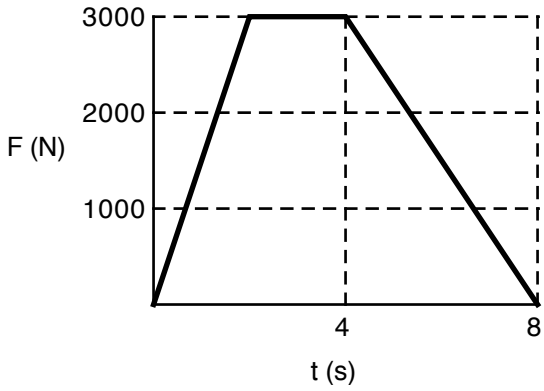
Momentum & Impulse

1. A 5.0 kg object with a speed of 30 m/s strikes a steel plate at an angle of 45° and rebounds with the same speed and angle. What is the change (magnitude and direction) of the linear momentum of the ball (relative to the steel plate.)

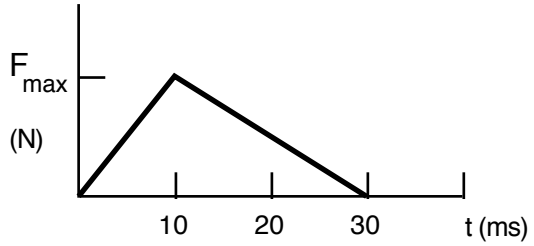
2. A 3 kg ball with an initial velocity of 15**i** m/s experiences an impulse of –20**i** + 30**j** Ns over a time interval of 0.04 seconds. What is the final velocity of the ball?

3. A super ball (mass = 0.035 kg) is thrown with a velocity of 15 m/s into a wall. It bounces back with a speed of 10 m/s. The ball and wall were in contact for only 0.02 seconds. What was the average force of the wall on the ball?

4. A 1500 kg car traveling at 10 m/s somehow experiences a net force as shown in the diagram. (The force is in the direction that the car was moving.) What is the final speed of the car?



5. A tennis ball of mass 0.1 kg bounces off a wall. It had an original speed of 30 m/s and bounces straight backwards with a speed of 20 m/s. The force verses time graph showing the impulse of the wall on the tennis ball is shown. What was the maximum force on the tennis ball?



Answers: *1) 212 kg•m/s, ⊥ and away from surface* *2) 8.3**i** + 10**j** m/s* *3) (-) 43.75 N*
4) 20 m/s *5) (-) 333 N*