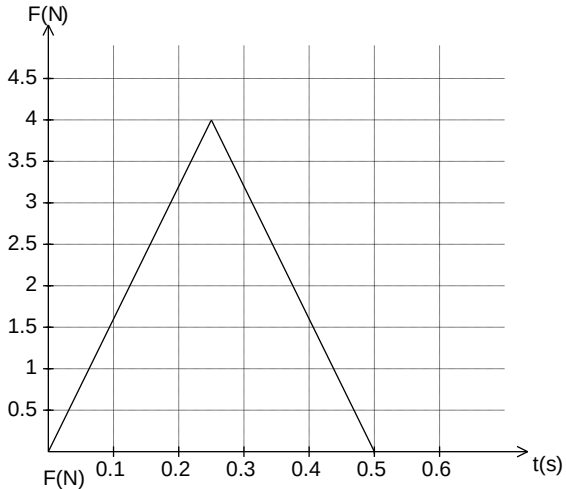
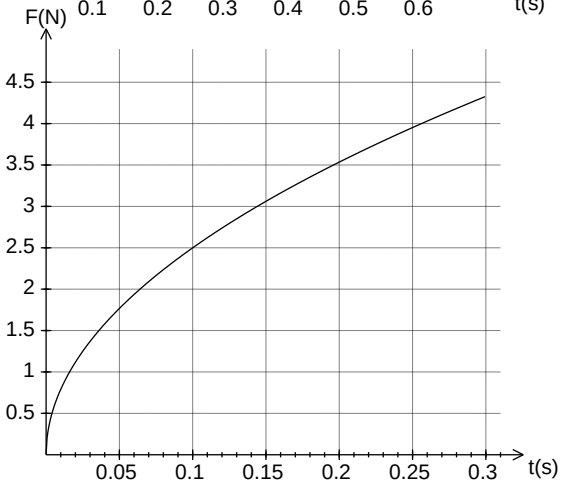
Momentum and Impulse

1. Calculate the momentum of each of the following objects:
    a. a 0.50 kg ball thrown up with a velocity of 30 m/s.
    b. a 2000 kg railway car moving south at 10 m/s
    c. the Earth, a mass of 5.97×10^{24}kg, moving at 2.98×10^{4}m/s.
2. The momentum of a 7.3kg shot is 22 kg·m/s [forward]. What is its' velocity?
3. A bullet travelling at 900 m/s has a momentum of 4.5 kg·m/s. Find its mass.
4. Find the impulse exerted when a force of force of 25N[E] is exerted on a cart for 3.2s. What would the resulting momentum be if the cart had an initial momentum of 100 kg·m/s [E].
5. Find the impulse on a hockey puck by a hockey stick exerting a force of 120N [forward] for 0.5s. What is the resultant momentum of the puck if the initial momentum was 20kg·m/s [backwards]?
6. Find the impulse exerted on a billiard ball bouncing off a cushion, if the force-time profile of the collision is as shown to the right.



7. Find the impulse exerted during a collision between a toy car and a wall, if the force time graph is as shown to the right.



8. A golf club exerts an average force of7.2×10^{3}N of a golf ball for the 5.0×10^{-4} s they are in contact.
    a. Calculate the impulse of the impact on the ball.
    b. If the mass of the ball is 45g, what velocity will it have as it leaves the club face (assuming it is not moving when the club initially hits it).

Answers : 1. a. 15kg·m/s[up], b. 2.0×10^{4}kg·m/s[south]. c. 1.80×10^{29} kg·m/s[forward], 2. 3.0m/s [forward], 3. 5.0×10^{-3}kg, 4. impulse=80N·s[E], final momentum=180kg·m/s[E], 5. J=60N·s[forward], p=40kg·m/s[forward], 6. 1.0N·s[forward], 7. 0.85N·s[forward], 8.a. 3.6N·s[forward], b. 80m/s[forward].