

PHYS 2211- Collisions, Impulse, and Explosions

Reading Day Review

Problem 1

A golf ball of mass 0.045 kg is hit off the tee at a speed of 45 m/s. The golf club was in contact with the golf ball for 3.5×10^{-3} s.

- Find the impulse imparted to the gold ball.
- Find the average force acting on the ball by the golf club.
- In a second swing, the magnitude of the force on the golf ball over the contact period is given by the expression:

$$F(t) = 100(1 + 100t)^4$$

What is the contact time if the golf ball leaves the tee with a speed of 45 m/s?

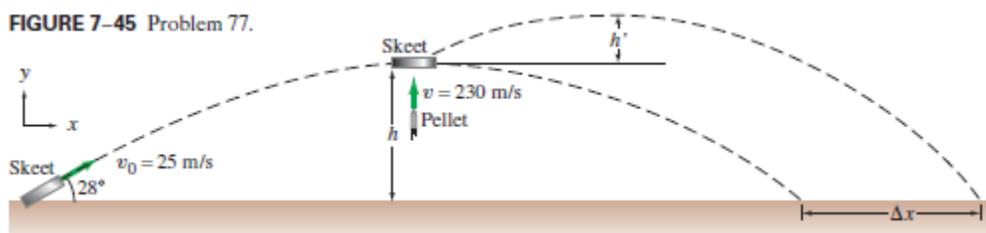
Problem 2

A 0.450-kg hockey puck, moving east with a speed of 4.80 m/s, has a head-on collision with a 0.900-kg hockey puck initially at rest.

- Assuming a perfectly elastic collision, what will be the speed and direction of each object after the collision?
- Instead assume this is an inelastic collision. If the final speed of the pucks are 1 m/s east and 3.2 m/s west, find the amount of kinetic energy lost.
- Now assume the puck had glue on it and the two pucks stick together after colliding. What is the speed of the combined mass after the collision?

Problem 3

A 0.25 kg skeet (clay target) is fired at an angle of 28 degrees to the horizon with a speed of 25 m/s. When it reaches the maximum height, h , it is hit from below by a 15m g pellet traveling vertically upward at a speed of 230 m/s. The pellet is embedded in the skeet.



- How much higher did the skeet go up? (Find h')
- How much extra distance does the skeet travel because of the collision? (Find Δx)

Problem 4

To prevent an asteroid from colliding with Earth, the space force blows it up. However, instead of being annihilated, the asteroid explodes into three pieces with masses m_1 , m_2 , and m_3 . In the chaos, one of the pieces cannot be tracked. The known information is represented in the chart below.

Object	Mass, kg	Velocity in the x direction, m/s	Velocity in the y direction, m/s
Original Asteroid	$M = 7.0 \times 10^5$	2.5×10^3	-5.0×10^3
Piece 1	$m_1 = 1.0 \times 10^5$	6.0×10^3	2.0×10^3
Piece 2	$m_2 = 4.5 \times 10^5$	1.0×10^3	-5.0×10^3
Piece 3	$m_3 = ???$???	???

- Fill in the missing data about piece 3.
- How much energy was released by the explosion?