

National University

of Computer & Emerging Sciences

Assignment 2

Fall 2023

NS 1001 Applied physics

Q.1. A rocket sled accelerates at 50 m/s^2 for 5.0 s, coasts for 3.0 s, then deploys a braking parachute and decelerates at 3.0 m/s^2 until coming to a halt.

- What is the maximum velocity of the rocket sled?
- What is the total distance traveled?

Q.2. Upon graduation a joyful physics student throws her cap straight upward with an initial velocity of 14.7 m/s. Given that its acceleration has a magnitude of 9.81 m/s^2 and is directed downward. Ignore air drag

- How long does it take for the cap to reach its highest point.
- What is the distance to the highest point?
- Assuming the cap is caught at the same height from which it was released, what is the total time the cap is in flight?

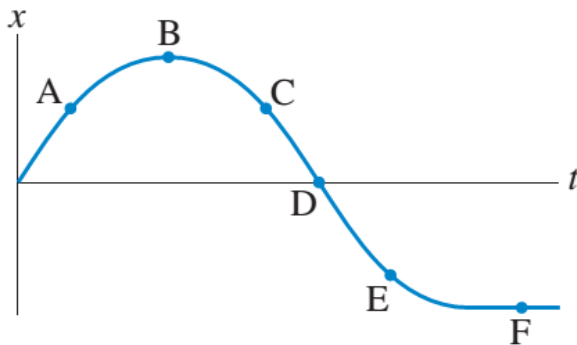
Q.3. A shelter Island ferry boat moves with a constant velocity $v_{ox} = 8 \text{ m/s}$ for 60 sec. It then shuts off its engines and coasts. Its coasting velocity is given by $v_x = v_{ox} t_1^2 / t^2$, where $t_1 = 60 \text{ s}$. What is the displacement of the boat for the interval $0 < t < \infty$?

Q.4. Fred catches the football while standing directly on the goal line. He

immediately starts running forward with an acceleration of 6 ft/s^2 . At the moment the catch is made, Tommy is 20 yards away and heading directly toward Fred with a steady speed of 15 ft/s . If neither deviates from a straight-ahead path, where will Tommy tackle Fred?

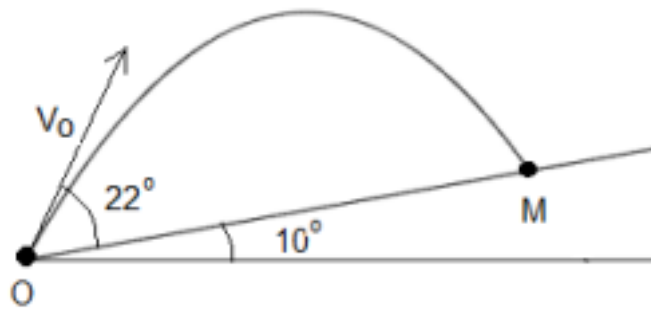
Q.5. Figure shows the position-versus-time graph for a moving object. At which lettered point or points:

- a. Is the object moving the fastest?
- b. Is the object moving to the left?
- c. Is the object speeding up?
- d. Is the object turning around?

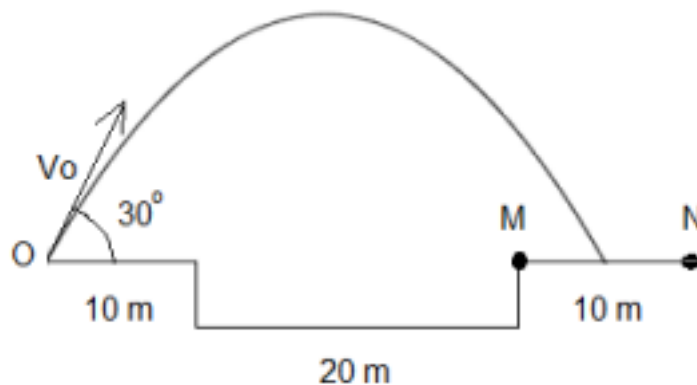


Q.6. A projectile is launched from point O at an angle of 22° with an initial velocity of 15 m/s up an incline plane that makes an angle of 10° with the horizontal. The projectile hits the incline plane at point M.

- a) Find the time it takes for the projectile to hit the incline plane.
- b) Find the distance OM.



Q.7. A projectile is to be launched at an angle of 30° so that it falls beyond the pond of length 20 meters as shown in the figure. What is the range of values of the initial velocity so that the projectile falls between points M and N?

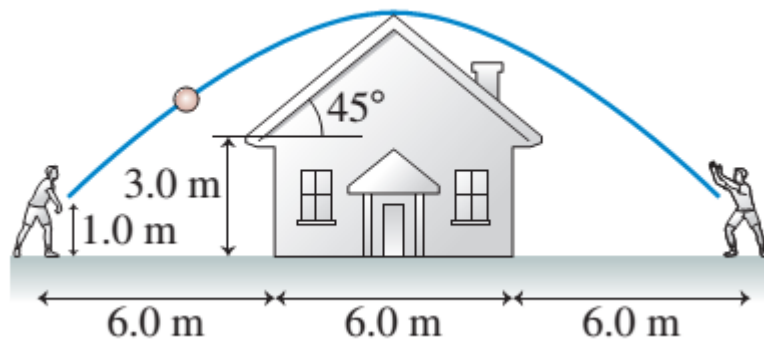


Q.8. The trajectory of a projectile launched from ground is given by the equation $y = -0.025x^2 + 0.5x$, where x and y are the coordinate of the projectile on a rectangular system of axes. Find the initial velocity and the angle at which the projectile is launched.

Q.9. You're 6.0 m from one wall of the house seen in Figure. You want to toss a ball to your friend who is 6.0 m from the opposite wall. The throw and catch each occur 1.0 m above the ground.

a. What minimum speed will allow the ball to clear the roof?

b. At what angle should you toss the ball?



Q.10. A ball is thrown toward a cliff of height h with a speed of 30 m/s and an angle of 60° above horizontal. It lands on the edge of the cliff 4.0 s later.

a. How high is the cliff?

b. What was the maximum height of the ball?

c. What is the ball's impact speed?

Q.11. An archer standing on a 15° slope shoots an arrow 20° above the horizontal, as shown in Figure . How far down the slope does the arrow hit if it is shot with a speed of 50 m/s from 1.75 m above the ground?

