National University

of Computer & Emerging Sciences

Name: **Roll**

CLO 02

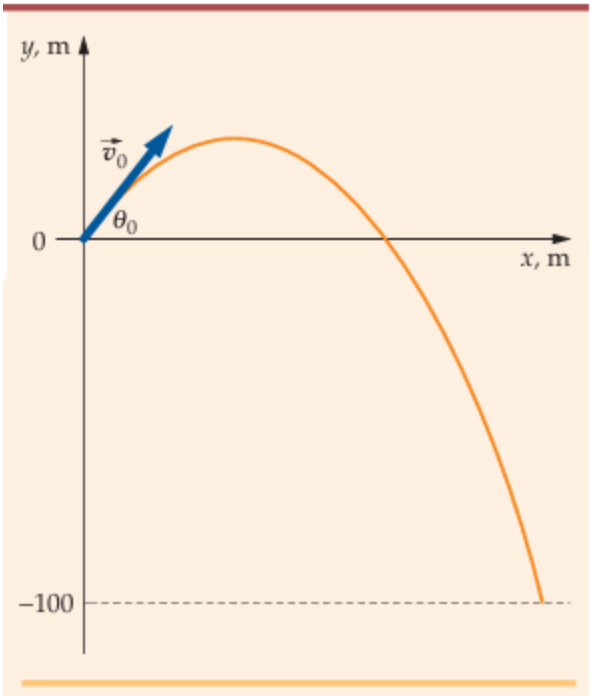
Dear students you donot need to submit the assignment, you will have assignment based quiz from this assignment in your respective classes according to your timetable on campus. The due date will 18th and 19th September2024 in Your respective time slots for all CS sections (A,B,C,D,E,F,G)

Q.1

At $t = 0$, a particle moving in the xy plane with constant acceleration has a velocity of $\mathbf{v}_i = (3.00\hat{\mathbf{i}} - 2.00\hat{\mathbf{j}})$ m/s and is at the origin. At $t = 3.00$ s, the particle's velocity is $\mathbf{v} = (9.00\hat{\mathbf{i}} + 7.00\hat{\mathbf{j}})$ m/s. Find (a) the acceleration of the particle and (b) its coordinates at any time t.

Q.2.

A helicopter drops a supply package to flood victims on a raft on a swollen lake. When the package is released, the helicopter is 100 m directly above the raft and flying at a velocity of 25.0 m/s at an angle $\theta_0 = 36.9°$ above the horizontal. (*a*) How long is the package in the air? (*b*) How far from the raft does the package land? (*c*) If the helicopter continues at constant velocity, where is the helicopter when the package lands? (Ignore effects of air resistance.)



Q.3.

A golf ball is hit off a tee at the edge of a cliff. Its x and y coordinates as functions of time are given by the following expressions:

$$x = (18.0\ \text{m/s})\,t$$

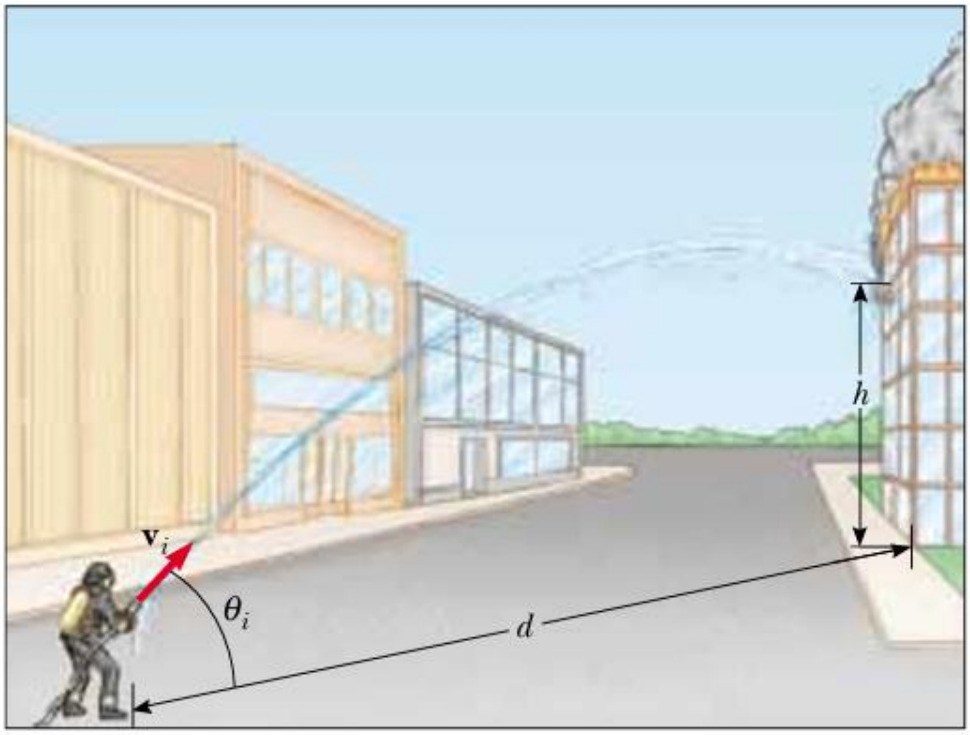
and $$y = (4.00\ \text{m/s})\,t - (4.90\ \text{m/s}^2)\,t^2$$

(a) Write a vector expression for the ball's position as a function of time, using the unit vectors $\hat{\mathbf{i}}$ and $\hat{\mathbf{j}}$. By taking

derivatives, obtain expressions for (b) the velocity vector $\mathbf{v}$ as a function of time and (c) the acceleration vector $\mathbf{a}$ as a function of time. Next use unit-vector notation to write expressions for (d) the position, (e) the velocity, and (f) the acceleration of the golf ball, all at $t = 3.00$ s.

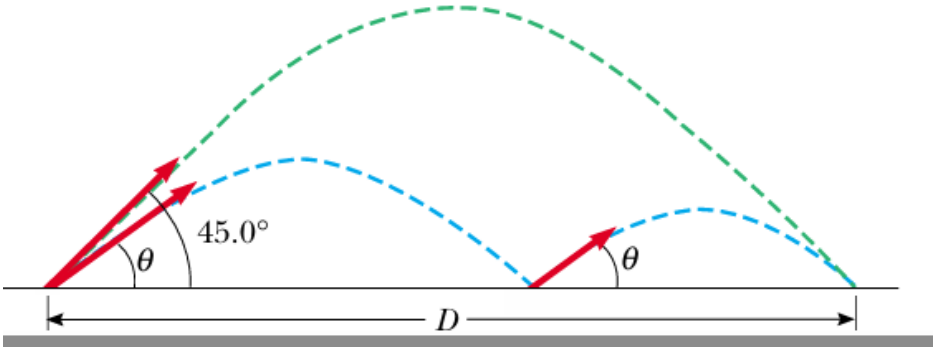
Q.4

A firefighter, a distance d from a burning building, directs a stream of water from a fire hose at angle θ_i above the horizontal as in Figure P4.20. If the initial speed of the stream is v_i, at what height h does the water strike the building?



Q.5.

. When baseball players throw the ball in from the outfield, they usually allow it to take one bounce before it reaches the infield, on the theory that the ball arrives sooner that way. Suppose that the angle at which a bounced ball leaves the ground is the same as the angle at which the outfielder threw it, as in Figure P4.55, but that the ball's speed after the bounce is one half of what it was before the bounce. (a) Assuming the ball is always thrown with the same initial speed, at what angle θ should the fielder throw the ball to make it go the same distance D with one bounce (blue path) as a ball thrown upward at 45.0° with no bounce (green path)? (b) Determine the ratio of the times for the one-bounce and no-bounce throws.

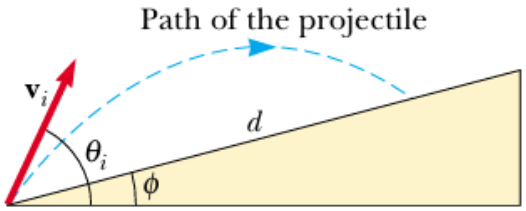


Q.6

. A projectile is fired up an incline (incline angle ϕ) with an initial speed v_i at an angle θ_i with respect to the horizontal ($\theta_i > \phi$), as shown in Figure P4.50. (a) Show that the projectile travels a distance d up the incline, where

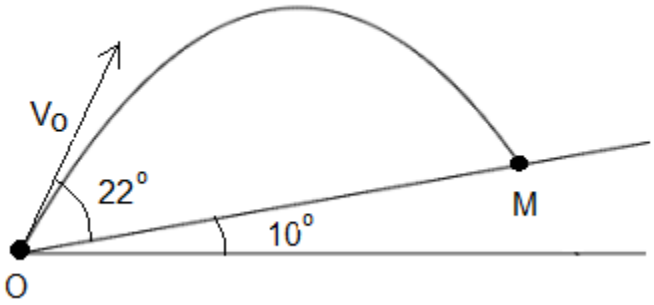
$$d = \frac{2v_i^2 \cos\theta_i \sin(\theta_i - \phi)}{g\cos^2\phi}$$

(b) For what value of θ_i is d a maximum, and what is that maximum value?



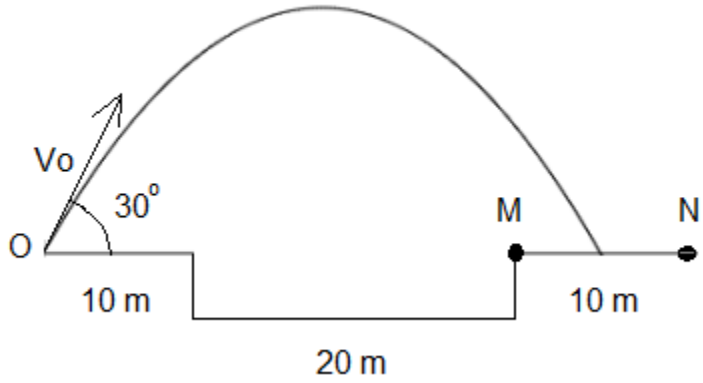
Q.7.

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.8

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?

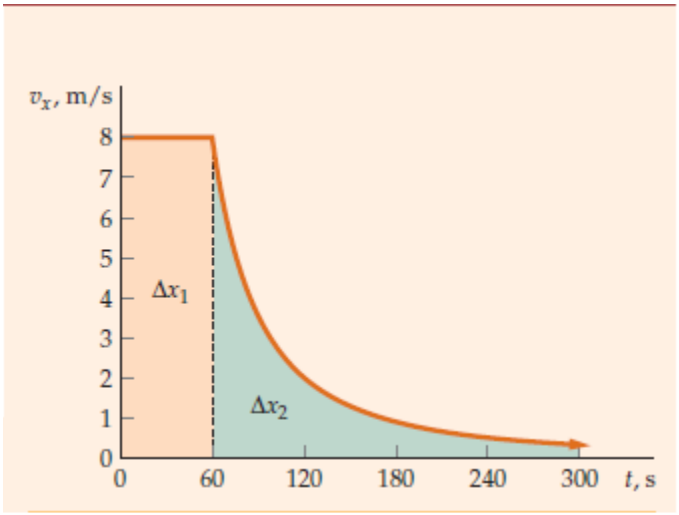


Q.9.

The trajectory of a projectile launched from ground is given by the equation $y = -0.025\ x^2 + 0.5\ x$, 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.10. A shelter Island ferry boat moves with a cosntant velocity v_{ox} =8 m/sfor 60 sec.It then shuts off its engines and coasts.Its coasting velocity is given by $v_x = v_{ox}\ t^2_1 / t^2$,

where t_1= 60 s.What is the displacement of the boat for the interval $0<t<\infty$?


v_x, m/s
8
7
6
5
4
3
2
1
0
Δx_1
Δx_2
0
60
120
180
240
300
t, s