

Workbook



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Buoyancy and Drift Forces

Drag Force

Questions

1) Skydiver.

A skydiver is jumping off a plane and opens a parachute.

Given: the friction force with the air is: $\vec{F} = -k\vec{v}$.

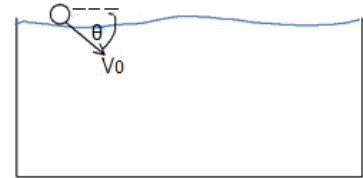
- Find the equation of motion.
- Find the terminal velocity.
- Find the velocity as a function of time if the skydiver starts at rest.



2) Ball is thrown in to a Pool.

A ball is thrown into a pool with an initial velocity of v_0 at an angle of θ relative to the water's surface.

You are given: Water Viscosity – η .



Ball Radius – R , Water Density – ρ_w and Ball Density – ρ_b , v_0 and θ .

- Write out the Equation of Motion for the ball.
- Find the terminal velocity.
- Find the maximal depth reached by the ball, if $\rho_b > \rho_w$.

Answer Key

1) a. $\sum F_y = mg - K_{vy} = ma_y$ b. $v_{y_{final}} = \frac{mg}{k}$ c. $v(t) = \frac{mg}{k} \left(1 - e^{-\frac{k}{m}t} \right)$

2) a. $c - kv_y = ma_y$, $\sum F_x = -kv_x = ma_x$ b. $v_{y_{final}} = \frac{mg - F_b}{6\pi\eta R}$

c. $y_{max} = \frac{cm}{k^2} \ln \frac{k(c - v_0 \sin \theta)}{c} + \frac{m}{k} (c - v_0 \sin \theta) \left[\frac{c}{k(c - v_0 \sin \theta)} - 1 \right]$