

H.W # 1

Q1. A solid lead cylinder has a mass of 56.5 kg and radius of 35 cm. Find the height of the cylinder in cm. (The density of lead is 11.3 g/cm³)

Sol: Density = (mass / volume), where volume of cylinder = $(\pi r^2) * h$

$$11.3 \text{ g/cm}^3 = (56.5 \times 10^3 \text{ g}) / (\pi 35^2 \times h \text{ cm}^3)$$

$$h = 1.3 \text{ cm}$$

Q2. An object is thrown at t=0 vertically upward with a velocity of 48.9 m/s. What is its average velocity between t=2 s and t=3 s? [Ignore air resistance]

Sol: $V_{avg} = (y_3 - y_2) / (t_3 - t_2)$, where since $y_0 = 0$

$$y_3 = V_0(t_3) - \frac{1}{2} g (t_3)^2 = 48.9 * 3 - \frac{1}{2} * 9.8 * 3^2 = 102.6 \text{ m}$$

$$y_2 = V_0(t_2) - \frac{1}{2} g (t_2)^2 = 48.9 * 2 - \frac{1}{2} * 9.8 * 2^2 = 78.2 \text{ m}$$

$$V_{avg} = (102.6 - 78.2) / (3 - 2) = 24.4 \text{ m/s}$$

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Q3. An electron moving along the x axis has a position given by $x = 40 t - 10 t^2$, where x is in m and t is in s. How far is the electron from the origin when it momentarily stops?

Sol: first, we have to find the time at the moment when $V=0$.

$$V = dx/dt = 40 - 20 t = 0 \Rightarrow t = 2 \text{ s.}$$

Second using that time to find x,

$$x = 40 (2) - 10 (2^2) = 40 \text{ m}$$

$$x = 40 \text{ m}$$