

AS 2D06 - QUIZ #1 - SOLUTIONS

1. (c) is false: for constant velocity, the slope of x vs. t is v , not $v^2/2$.

2. (c) and (d) are true: either choice is fine

(c): $v(t) = v_0 + at$; after T : $0 = v_0 - gT \Rightarrow T = \frac{v_0}{g}$

$$v(T/2) = v_0 - g\left(\frac{v_0}{2g}\right) = v_0 - \frac{v_0}{2} = \frac{v_0}{2}$$

(d): ball comes back to starting point in time $2T$
 \rightarrow speed v_0

3. (a) $v_{av} = \frac{\Delta x}{\Delta t} = \frac{x(3) - x(1)}{3 - 1}$

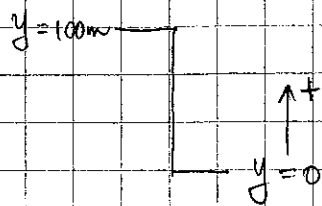
$$x(3) = 35 - 6.5(3) - 1.3(9) = 3.8 \text{ m}$$

$$x(1) = 35 - 6.5 - 1.3 = 27.2 \text{ m}$$

$$\therefore v_{av} = \frac{3.8 - 27.2}{3 - 1} = -11.7 \text{ m/s}$$

(b) $v(t) = \frac{dx}{dt} = -6.5 - 2.6t$

$$\therefore v(4) = -6.5 - 2.6(4) = -16.9 \text{ m/s}$$

4.

$$\textcircled{1} \quad y_1 = 100 + 5t - 4.9t^2$$

$$\textcircled{2} \quad y_2 = 100 - 20(t-2) - 4.9(t-2)^2$$

when they meet: $y_1 = y_2$

$$\cancel{100} + 5t - \cancel{4.9}t^2 = \cancel{100} - 20t + 40 - \cancel{4.9}(t^2 - 4t + 4)$$

$$5t = -20t + 19.6t - 19.6 + 40$$

$$54t = 20.4 \Rightarrow t = 3.8 \text{ seconds}$$

where: $y_1 = 100 + 5(3.8) - 4.9(3.8)^2$

$$= 100 + 19 - 70.8$$

$$= 48.2 \text{ m (from the bottom)}$$

5.

$$V_y = V_{oy} + at$$

$$V_y = V_{oy} - 9.8t \quad \therefore \text{at 3 seconds: } -4 = V_{oy} - 9.8(3)$$

$$\therefore V_{oy} = 25.4 \text{ m/s}$$

$$y = y_0 + v_0t + \frac{at^2}{2}$$

$$0 = 25.4t - 4.9t^2 \Rightarrow 4.9t = 25.4$$

$$t = 5.2 \text{ seconds}$$