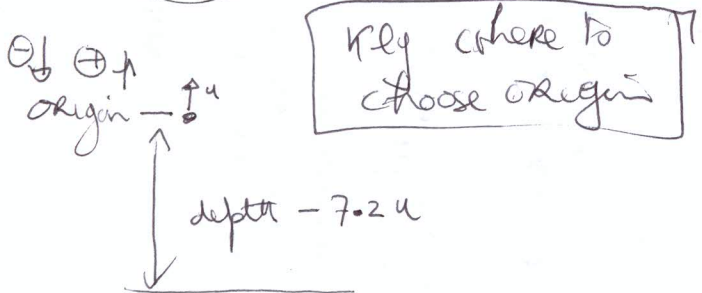
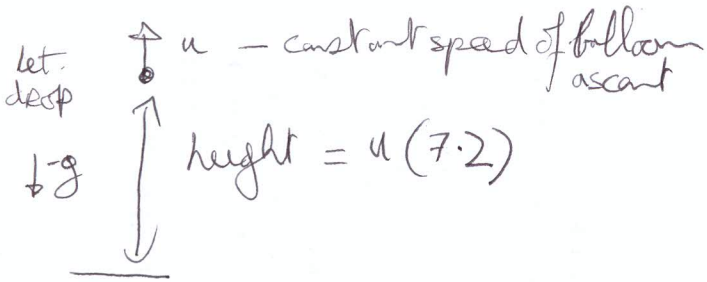


H192(a)



$S = \text{distance above / below origin}$

$S = ut + \frac{1}{2}at^2$

$S_{\text{subground}} = u(9) - \frac{1}{2}(9.8)t^2$

$S_{\text{subground}} = 9u - 396.9$

when looking ground photo ground

$7.2u \text{ below origin} \Rightarrow$

$-7.2u = 9u - 396.9$

$-16.2u = -396.9$

$\Rightarrow u = 24.5 \text{ m/s}$

$\therefore \text{height} = 7.2(24.5) = 176.4 \text{ m}$

①, ② $\Rightarrow t_2 = 9 - 2\left(\frac{u}{9.8}\right) = 9 - \frac{u}{4.9}$

$\therefore 7.2u = u\left(9 - \frac{u}{4.9}\right) + 4.9\left(9 - \frac{u}{4.9}\right)^2$

$7.2u = 9u - \frac{u^2}{4.9} + 4.9(81 - \frac{18u}{4.9} + \frac{u^2}{(4.9)^2})$

$7.2u = 9u - \frac{u^2}{4.9} + 4.9(81) - 18u + \frac{u^2}{4.9}$

$\Rightarrow 7.2u = -9u + 396.9$

$\Rightarrow 16.2u = 396.9$

$\Rightarrow u = \frac{396.9}{16.2} = 24.5$

$\therefore \text{height} = 7.2(24.5) = 176.4 \text{ m}$

1992(b)

(i) $S_p = 1(t) + 0.5(5)t^2$

$S_q = 11(t) + 0.5(4)t^2$

$S_p + 25.5 = S_q$

$t^2 - 20t + 51 = 0$

$(t-3)(t-17) = 0$

$t = 3 \text{ or } t = 17$

(ii) distance = $S_q - S_p - 25.5$

$= 10t - 0.5t^2 - 25.5$

$\frac{d(\text{distance})}{dt} = 10 - t$

$= 0 \text{ when } t = 10$

Maximum distance = $10(10) - 0.5(100) - 25.5 = 24.5 \text{ m}$

$q = 2t_1 + t_2$ (1) $t_1 \parallel t_2$

$S_1 = \text{dist from release to rest}$

$(S_1 = ut_1 - 4.9t_1^2)$

$\underline{v=0} \Rightarrow 0 = u - 9.8t_1 \Rightarrow t_1 = \frac{u}{9.8}$ (2)

Find t_2 :

$s = ut + \frac{1}{2}at^2$

$7.2u = ut_2 + \frac{1}{2}(9.8)t_2^2$

$7.2u = ut_2 + 4.9t_2^2$ (3)