University of Jordan / Physics Dept
physics for Medical and dentistry St.
(0342105)
Solutions for Chapter (2) / Giancoli 7th edition.
Prof. Mahmoud Jaghoub

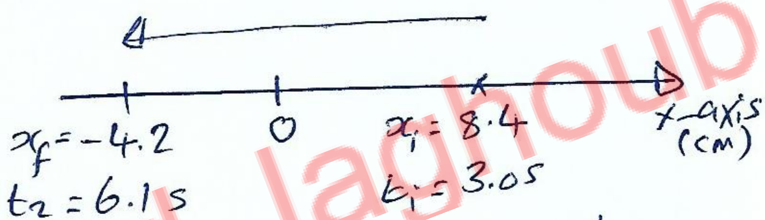
4] $x_1 = 8.4\,cm$, $x_2 = -4.2\,cm$

$$\bar{v}_{3-6.1} = \frac{v(6.1) - v(3)}{6.1 - 3}$$

$$= \frac{-4.2 - 8.4}{3.1}$$

$$= -4.06\ cm/s$$

$$= -4.06 \times 10^{-2}\ m/s.$$



Note motion is along $-ve$ x-direction $\Rightarrow$ $\bar{v}$ is negative.

20] $v_i = 65\,\frac{km}{h} = 65 \times \frac{1000}{3600}\,\frac{m}{s} \approx 18.1\ m/s$

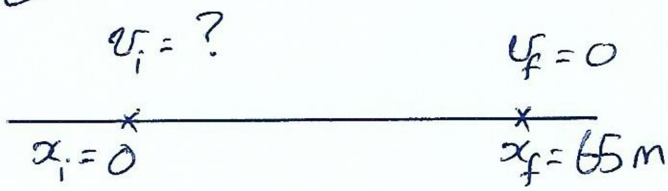
$v_f = 120\,\frac{km}{h} \simeq 33.3\ m/s$

$a = 1.8\,m/s^2$. [Note because a in m/s^2 we change v from $\frac{km}{h} \rightarrow m/s$. Alternatively you can leave v in km/h but have to change $a \Rightarrow km/h^2$] [$a = 23328\ km/h^2$]

$$v_f = v_i + at$$

$$t = \frac{v_f - v_i}{a} = \frac{33.3 - 18.1}{1.8} \simeq 8.4\ s.$$

28] comming to a stop $\Rightarrow v_f = 0$.



$a = -4\ m/s^2$

$v_f^2 - v_i^2 = 2a(x_f - x_i)$

$0 - v_i^2 = 2(-4)(65-0) \Rightarrow v_i \simeq 22.8\ m/s$.

39] Time of flight $= 3.4\,s$

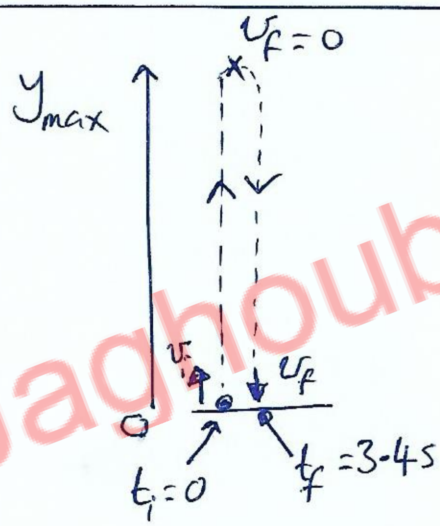
Time to max. height $= \frac{3.4}{2} = 1.7\,s$.

$+\uparrow$ $\boxed{a = -g}$

$y_f - y_i = v_i t - \frac{1}{2} g t^2$

$0 - 0 = v_i(3.4) - \frac{9.81}{2}(3.4)^2$

$\therefore v_i \simeq 16.66\ m/s$.



$y_{max} - y_i = v_i t - \frac{1}{2} g t^2$

$y_{max} - 0 = 16.66(1.7) - \frac{9.81}{2}(1.7)^2$

$y_{max} \simeq 14.1\ m$.

Note: time to reach y_{max} is $1.7\,s$.

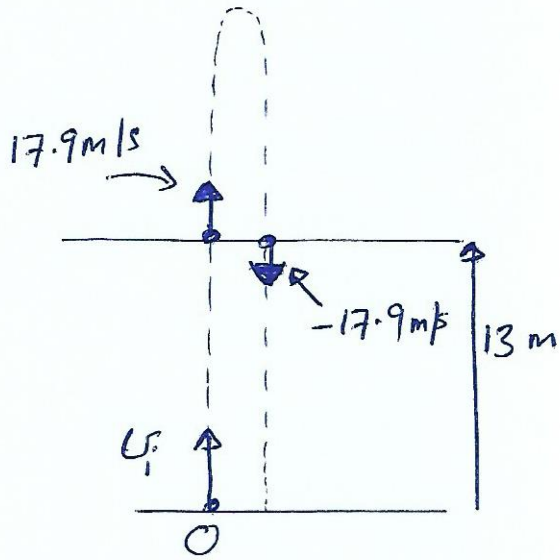
Alternatively:

at max. height $v_f^2 - v_i^2 = -2g(y_{max} - y_i)$

$0 - (16.66)^2 = -2(9.81)(y_{max} - 0)$

$\therefore y_{max} \simeq 14.1\ m$ as before!

43] $\overset{+}{\uparrow}$ $\boxed{a=-g}$ $\Rightarrow v_i = 24 m/s$.



a) $v_f^2 - v_i^2 = -2g(y_f - y_i)$

$v_f^2 - (24)^2 = -2(9.81)(13-0)$

$\Rightarrow v_f = \pm 17.9 \; m/s$

$v_f = 17.9$ while moving up

$v_f = -17.9$ while moving down.

(b) $y_f - y_i = v_i t - \frac{1}{2} g t^2$

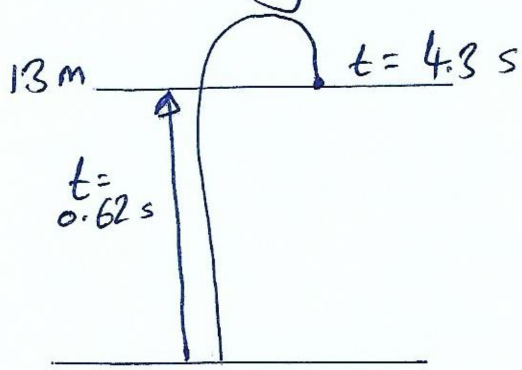
$13 - 0 = 24t - \frac{9.81}{2} t^2$

$4.905 t^2 - 24t + 13 = 0$

$t = \dfrac{24 \pm \sqrt{(24)^2 - 4(4.905)(13)}}{2 \times 4.905} = \dfrac{24 \pm \sqrt{320.94}}{9.81}$

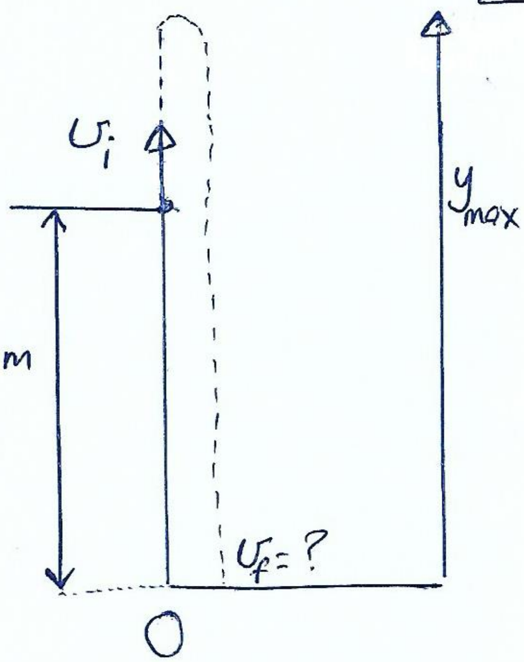
$t = \dfrac{24 - 17.9}{9.81} \approx 0.62 \; s$. (on the way up)

$t = \dfrac{24 + 17.9}{9.81} \approx 4.3$ (on the way down).



$v_i = 15.5 \text{ m/s}$

65] $\overset{+}{\uparrow}$ $\boxed{a = -g}$



(a) $y_f - y_i = v_i t - \frac{1}{2} g t^2$

$0 - 75 = 15.5t - \frac{9.81}{2} t^2$

$4.905t^2 - 15.5t - 75 = 0$

$t = \dfrac{15.5 \pm \sqrt{(15.5)^2 - 4(4.905)(-75)}}{2 \times 4.905}$

$= \dfrac{15.5 \pm 41.4}{9.81}$

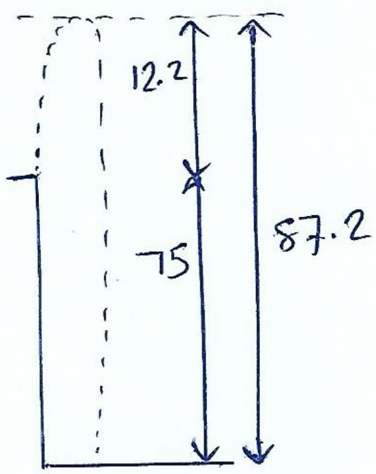
$t = \dfrac{15.5 + 41.4}{9.81} \approx 5.80 \text{ s}$ (ignore negative value).

(b) $v_f = v_i - gt = 15.5 - 9.81(5.8) \approx -41.4 \text{ m/s}$ (moving down)

(c) $v_f^2 - v_i^2 = -2g(y_{max} - y_i)$

$0 - (15.5)^2 = -2(9.81)(y_{max} - 75)$

$\therefore y_{max} \approx 87.2 \text{ m}$



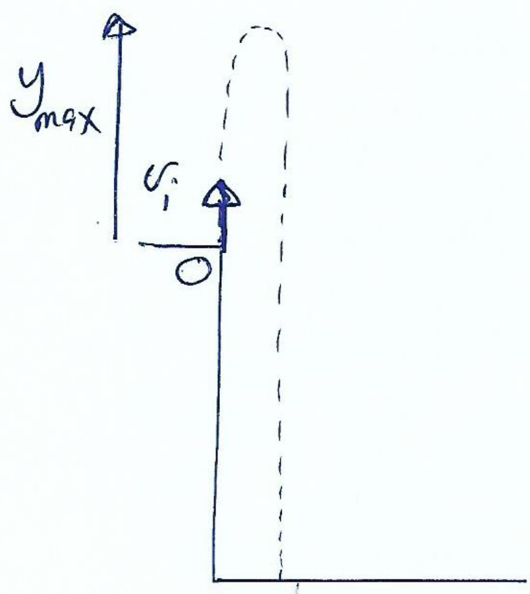
total distance covered $= (87.2) \times 2 - 75$
$= 99.4 \text{ m}$

average speed $\bar{s} = \dfrac{99.4}{5.80} = 17.1 \text{ m/s}$

average velocity $\bar{v} = \dfrac{-41.4 + 15.5}{2} = \dfrac{v_f + v_i}{2}$
$\simeq -13 \text{ m/s}$

OR $\bar{v} = \dfrac{y_f - y_i}{t_f - t_i} = \dfrac{0 - 75}{5.8} \sim -13 \text{ m/s}$

Suppose a student chose the origin at the cliff of the building. and still chose up as positive.



(a) $y_f - y_i = v_i t - \frac{1}{2} g t^2$

$-75 - 0 = (15.5)t - \frac{9.81}{2} t^2$

$\therefore \quad 4.905 t^2 - 15.5 t - 75 = 0$

(same as before) $\Rightarrow t \sim 5.80$ s.

Note: $y_i = 0$

(b) $v_f^2 - v_i^2 = -2g(y_{max} - y_i)$

$0 - (15.5)^2 = -2(9.81)(y_{max} - 0) \Rightarrow y_{max} \approx 12.2$ m/s.

(c) distance covered $= 2 \times y_{max} + 75$

$= 2 \times 12.2 + 75 = 99.4$ m as before.