12.6 (Ver. 8)

$s = (t^3 - 3t^2 + 2)\ m$

v_{avg}, $(v_{sp})_{avg}$, a when $t = 4s$?

— $v_{avg} = \dfrac{\Delta s}{\Delta t} = \dfrac{s_2 - s_1}{\Delta t}$

$s_2 = s\big|_{t=4} = (4)^3 - 3(4)^2 + 2 = 18\ m$

$s_1 = s\big|_{t=0} = 2\ m$

$\therefore\ v_{avg} = \dfrac{18-2}{4} = 4\ m/s$

$(v_{sp})_{avg} = \dfrac{s_T}{\Delta t}$;

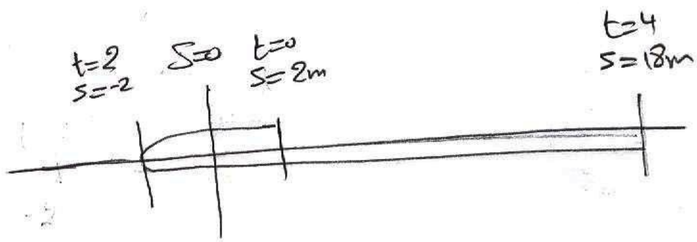
— $v = \dfrac{ds}{dt} = 3t^2 - 6t = 0$

$\Rightarrow t(3t-6) = 0$

$t = 0$; $t = 2s$

$s\big|_{t=2} = 2^3 - 3(2)^2 + 2 = -2\ m$

$\Rightarrow (v_{sp})_{avg} = \dfrac{2+2+2+18}{4} = 6\ m/s$



— $a = \dfrac{dv}{dt} = 6t - 6$

$a\big|_{t=4s} = 6(4) - 6 = 18\ m/s^2$

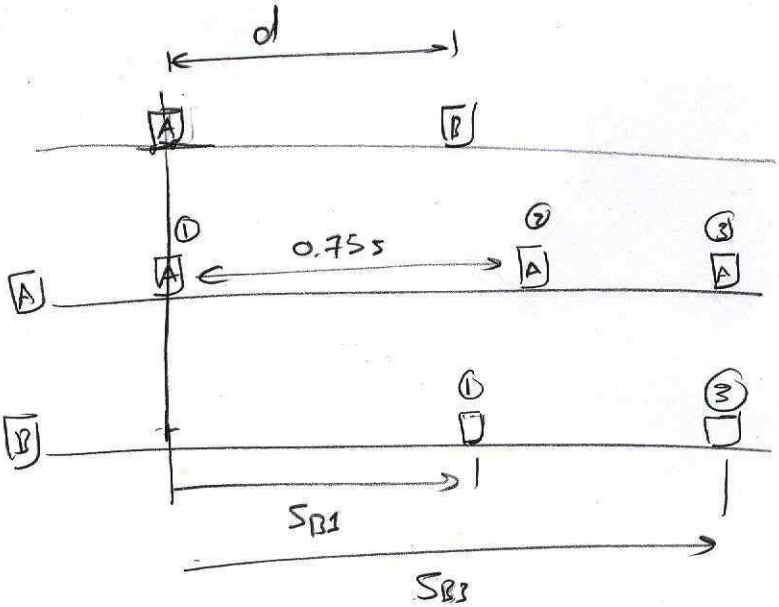
12-19 (Ver 8)

$V_{A1} = V_{BF}$ 60 ft/s

$a_B = -12$ ft/s

Reaction time for A = 0.75

$a_A = -15$ ft/s ; min d?



at 3

$S_{A3} = S_{B3}$

$t_{B3} = t_{A3}$ assuming $t_{A1} = t_{B1} = 0$

$V_{B3} = V_{A3}$ no collosion, min d

$S_{B1} = d$

$S_{A2} = (V_A)_{1\to 2} \times t_2 = 60 \times 0.75 = 45$ ft. [constant velocity]

[const. acc.]

$S_{A3} = S_{A2} + V_{A2}(t_3 - t_2) + \frac{1}{2}(a_A)(t_3 - t_2)^2$

$S_{A3} = 45 + 60(t_3 - t_2) - \frac{1}{2}(15)(t_3 - t_2)^2$

$V_{B3} = V_{A3}$

$V_{B2} + a_B(t_3 - t_1) = V_{A2} + a_A(t_3 - t_2)$

$\cancel{60} - 12(t_3 - 0) = \cancel{60} - 15(t_3 - 0.75)$

$\Rightarrow t_3 = 3.75$ s

$\rightarrow S_{A3} = 45 + 60(3.75 - 0.75) - \frac{1}{2}(15)(3.75 - 0.75)^2 = 157.5$ ft $= S_{B3}$

$S_{B3} = S_{B1} + V_{B1}(t_3 - t_1) + \frac{1}{2} a_B (t_3 - t_2)^2$

$= d + 60(3.75) + \frac{1}{2}(12)(3.75)^2 = d + 140.6$

$\Rightarrow d = 16.9$ ft.

12-22 Ver 8

$a = -2v$ m/s

at $t=0 \Rightarrow s=0$; $v = 20$ m/s

$s(t)$; $v(t)$; $a(t)$?

$$v\,dv = a\,ds$$

$$\int_{20}^{v} \cancel{v}\,dv = \int_{0}^{s} -2\cancel{v}\,ds$$

$$v - 20 = -2s$$

$$\frac{ds}{dt} = -2s + 20 \Rightarrow ds = (-2s + 20)dt$$

$$\int_{0}^{s} \frac{ds}{-2s+20} = \int_{0}^{t} dt$$

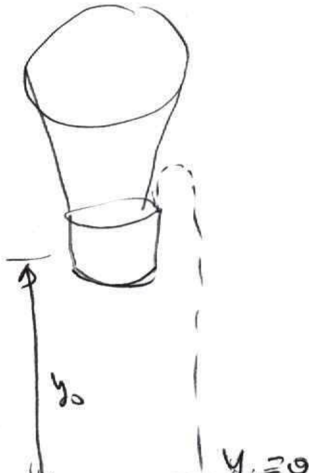
$$-\frac{1}{2}\ln(-2s+20) = t$$

$$-2s + 20 = e^{-2t} \Rightarrow s = 10 - \frac{e^{-2t}}{2} \text{ m}$$

$$v = e^{-2t} \text{ m/s}$$

$$a = -2e^{-2t} \text{ m/s}^2$$

12-26 8th Ver



$V_0 = 6$ m/s ↑ $(t=0)$

$t = 8s \Rightarrow$ hits the ground

V_2 ? y ballon ?

for the bag

$$V_2 = V_0 + a_c \Delta t$$

$$V_2 = 6 - 9.81(8) = -72.48 \text{ m/s} = 72.48 \text{ m/s} \downarrow$$

$$V_2^2 = V_0^2 + 2a_c(y_2 - y_0)$$

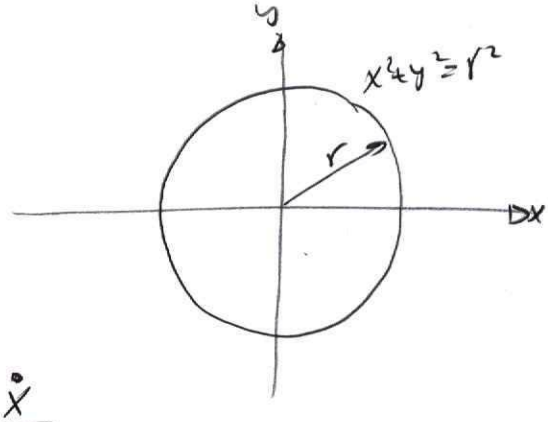
$$(72.48)^2 = (6)^2 - 2 \times 9.81(0 - y_0)$$

$$\Rightarrow y_0 = 265.9 \text{ m}$$

for the ballon

$$y_2 = y_0 + V_0 t + \cancel{\tfrac{1}{2}a_c t^2} = 265.9 + 6(8) = 313.9 \text{ m}$$

12-76 8^{th} Ed.



$x^2+y^2=r^2$

$V_x=t^2$

$y=\sqrt{r^2-x^2}=(r^2-x^2)^{1/2}$

$\dot{y}=V_y=\cancel{\frac{1}{2}}(r^2-x^2)^{-1/2}\cdot -\cancel{2}x\dot{x}=\frac{-x\dot{x}}{\sqrt{r^2-x^2}}$

OR $\;2x\dot{x}+2y\dot{y}=0$

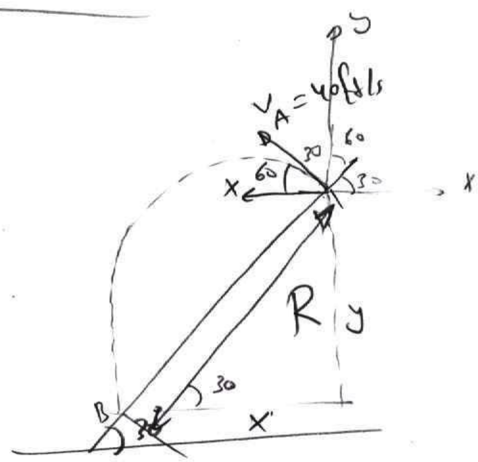
$V_y=\dot{y}=\frac{-x\dot{x}}{y}=\frac{-x\dot{x}}{\sqrt{r^2-x^2}}=-\frac{x}{y}t^2$

$a_x=2t$

$\dot{x}^2+x\ddot{x}+\dot{y}^2+y\ddot{y}=0$

$a_y=\frac{-(\dot{x}^2+x\ddot{x}+\dot{y}^2)}{y}=\frac{-\left(t^4+2xt^2+\left(\frac{x}{y}\right)^2t^4\right)}{y}$

12-90 Ver 8



$x^2+y^2=R^2$; $\quad x=R\cos 30$; $\quad y=R\sin 30$

$R\cos 30=x=x_0+(V_0)_x t=0+V\cos 60\,t$

$t=\frac{R\cos 30}{V\cos 60}=\frac{R}{40}\tan 60$

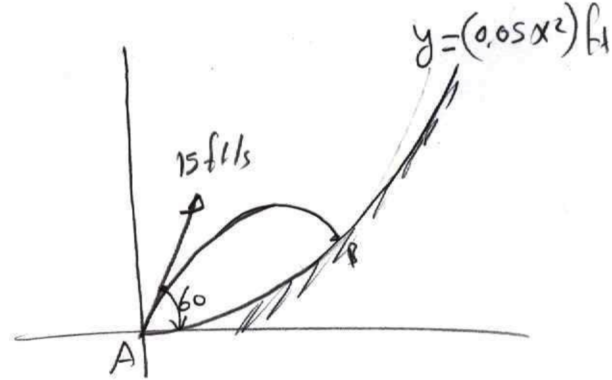
$y=y_0+(V_0)_y t+\frac{1}{2}at^2$

$-R\sin 30=0+\cancel{V}\sin 60\left(\frac{R}{\cancel{40}}\tan 60\right)-\frac{1}{2}(32.2)\left(\frac{R}{40}\tan 60\right)^2$

$0=2R-3.019\times10^{-2}R^2$

$\Rightarrow R=0$; $\quad R=\frac{2}{3.019\times10^{-2}}=66.25$ ft.

12-97 Ver 8



$$x_B = x_A + (v_0)_x t$$

$$t = \frac{x_B}{v_0 \cos 60}$$

$$y_B = y_A + (v_0)_y t - \frac{1}{2}(32.2)t^2$$

$$0.05 x_B^2 = 0 + \cancel{v_0} \sin 60 \left(\frac{x_B}{\cancel{v_0} \cos 60}\right) - \frac{32.2}{2}\left(\frac{x_B}{v_0 \cos 60}\right)^2$$

$$0 = 1.732\, x_B - 0.3362\, x_B^2$$

$$x_B = 0 \quad \alpha \quad ; \quad x_B = \frac{1.732}{0.3362} = 5.151 \text{ ft}$$

$$y_B = 0.05 \times (5.151)^2 = 1.327 \text{ ft.}$$